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THE DETERMINANTS OF INVESTMENT DEMAND FOR FARM CREDIT IN CANADA, 1950-1975: AN ECONOMETRIC APPROACH

by

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DEDICATED TO:

MY PARENTS AND BROTHER

ABSTRACT

The study attempted to investigate the factors which influence the demand for short, intermediate and long term farm credit by Canadian farm operators. Special attention was directed to evaluation of the possible effects of existing credit policies and government intervention in the long term market on the short run demand for long term (real estate) credit. A discussion of trends in the demand for the various types of farm credit and indebtedness in the farm sector is presented.

The demand for farm credit was conceived as a derived demand for farm investment inputs. Models were developed to serve as a means of explaining variations in the demand for farm credit and for use in forecasting the demand for farm credit. Econometric analyses were applied to annual data from 1950 to 1975 as a means of investigating the effects of the candidate variables on the investment demand for the various types of farm credit.

Results of the analyses performed seem to suggest that farm capital accumulation, costs of production and the effects of inflation and depreciation are important determinants of farm investments. Technological developments in the farm sector have also played a major role as a causal factor in the growth of demand for farm credit. Changes in the Gross National Expenditure, interest rates on the various types of farm credit extended, and inventory accumulation, showed up as important determinants for short term and short run (year-to-year) demand for long term credit.

The last observation indicates the importance of non-farm originating factors such as the effects of business cycle fluctuations and monetary policy on the demand for farm credit in the short run (yearly basis). Over the long run, however, the effects of these factors seem to be minimal.

Net farm income did not show up as a significant determinant of the investment demand for farm credit. The results, however, indicate that increases in net farm incomes exert an adverse effect on the demand for farm credit. Farm credit, therefore, appears to be an "inferior commodity". The results also attest to the relevance of the residual funds hypothesis. No structural changes seem to have occurred as a result of increased governmental involvement in the long term farm credit market. Results of the analyses of the short run demand for real estate credit confirms the existence of a negative adjustment factor which affects the demand for long term farm credit. The adjustment factor was attributed to declining farm incomes and the effects of present credit policies of the lending agencies in the long term market.

Suggestions were advanced on the basis of the results of the data. These include the need for increased research into low cost techniques of production, the institution of viable income stabilization and promotion policies, solution of land organization problems, and stepped up farmer education in farm management.

Finally research into the potential effects of changes in the conditions surrounding the operation of lending agencies should

be investigated. An investigation into response of lending agencies in the credit market to such changes is needed.

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CHAPTER I

INTRODUCTION

The subject of farm credit has become important over the last two to three decades. During this period, a growing proportion of farm financial needs were obtained from non-farm sources. These include off-farm work, dividends on off-farm investments and farm credit. The total amount of credit extended by lending agencies (both short, intermediate and long term) rose appreciably. The total estimated amount of all types of credit extended increased from $499.4 million in 1950 to $5413.4 million in 1975.[1] Several factors contributed to this trend.

1. The crippling after-effects of the economic depression of the late 1930's and early 1940's which gave rise to the need to turn to non-farm sources for financing the farm operation. The intervention of government in the agricultural credit market in a bid to enhance and sustain prosperity of farmers, served as an additional factor to contribute to the increase in demand for off-farm financing.[2]

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[1] R.S. Rust, Canadian Farm Economics, Canadian Department of Agriculture (Various Issues).

[2] Report of the Federal Task Force on Agriculture: Canadian Agriculture in the Seventies, Queens Printer, Ottawa, December, 1969.

2. The Act under which the Federal government financially assisted veterans of the second World and Korean wars in an effort to help establish them as full-time farmers.[3]

3. The technological revolution that occurred in the introduction of high cost, labor-saving, capital intensive and energy consuming techniques of production created the need for an increase in the rate of farm investment in the effort by farmers to remain competitive.

4. The steady increase in costs of production resulting from the technological revolution, and the need for structural adjustment and specialization over a period in which farm incomes have been fluctuating and declining (in real terms), reduced the capability for re-investment out of accumulated earnings in the farm sector. The end effect was that it became difficult, if not impossible, for retiring farmers to accumulate enough assets to enable the transfer of debt-free farms to their heirs. The inheritors who

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[3] "Veterans' Land Act" - Federal Agricultural Legislation Up to 1975, Canada Dept. of Agric, Ottawa, Economics Branch Publication No. 75/1.

usually have few savings have had to turn to credit markets for their financing needs.[4,5]

5. In addition to the structural adjustments that have been occurring in the agricultural sector, the last two decades have witnessed a growing trend towards incorporation and integration in the farm sector as well as an increasing management capability of Canadian farm operators. These trends have facilitated and created the need for a change in the financial management practices of farm operators.
6. The educational and marketing programs supported by the several lending agencies (both public and private) in the agricultural credit market, have contributed to a change in attitude of rural folk towards commercial credit and its usefulness in their farm operation.[6]

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[4] M.E. Andal, "Economic Guidelines for Present and Future Capital Use in Canadian Agriculture", Canadian Journal of Agricultural Economics, November, 1969, pp. 12-14.

[5] J.R. Brake, "Future Capital and Credit Needs of Canadian Agriculture", Dept. of Agricultural Economics, University of Guelph Publication No. AE 70/3.

[6] Report of the Federal Task Force on Agriculture: op. cit.

The Problem

Several problems have arisen as a result of the increase in the demand for farm credit. Some of them have been resolved by changing credit policies of the lending agencies by modifying existing ones. Some of the problems have persisted, however, and have become more pressing in recent times. The frequently discussed problems include:

1. The use of concessionary interest rates and its effect on the performance of the credit markets.
2. Economic justification for the fixed loan limits on long term credit and the potential effects of this practice, not only on the other credit markets, but also on the productivity of farm resources.
3. Questions raised about the structural organization and coordination of the farm credit markets.
4. The continuation of, and the mode of intervention of government in the credit markets.
5. The increasing indebtedness of Canadian farm operators and their ability to meet their payment obligations.
6. Lack of information about the financial structure and financial management practices of farm operations and operators, respectively.
7. Lack of information about the behavioural characteristics of farmers and the factors that influence their demand for farm credit.

The questions in the following summary throw some light on this situation.

> " Many questions may be raised with respect to the capital and credit needs of the Canadian agricultural industry industry. What are the capital requirements of an efficient farm business in various regions of Canada? How are these capital requirements to be met? Are the present lending institutions meeting the needs of Canadian farmers? What changes need to be made in existing credit policies? Are farmers equipped from a management point of view and are they willing to accept the type of credit policies which may be needed for their industry? Should, and can the needs of agriculture be provided from the private lending institutions or will a greater degree of government involvement be warranted?" 7

Objectives of the Study

The study will attempt to answer some of the questions posed above and will provide some pragmatic suggestions toward their solution. The following, however, are the specific objectives of the study.

1. To investigate the principal determinants of the demand for short, intermediate and long term farm credit in Canada, and also the extent and direction of response of farm operators to these factors.
2. To investigate any significant changes in the level

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7 Report of the Federal Task Force on Agriculture, op. cit., Ch. 13, pp. 335.

See also: M.E. Andal; J.R. Brake; op. cit. , and W. Lee. Funding of Farm Mortgage Credit in Canada, (Unpublished Paper); Kristjanson, B.H, "Public or Private Financing - Cooperation or Confrontation", Paper presented at 3rd Annual Canadian Banker's Association's Agricultural Credit Conference, Toronto, October 27-28, 1975.

of relative importance of these factors during the period covered by the study for long term credit.

3. To compare and contrast the principal determinants that affect the demand of long, intermediate and short term credit, respectively.
4. To develop econometric models which would serve to explain variations in the demand for farm credit, and also be used as a predictive tool.

Hypotheses

Based upon the discussion in the previous sections, the following hypotheses are advanced:

1. That increasing costs of production, farm size and capital accululation, technological developments, annual changes in gross national expenditure are positively related to the demand for farm credit and they are all important factors in this respect.
2. That interest rates on borrowed funds, net farm incomes, depreciation costs and changes in inventory accumulation are negatively related to the demand for farm credit and are important factors influencing demand for credit.
3. That there have been no significant changes in the relative importance of the factors which affect the

demand for farm credit over the time span covered by the study.

4. That the use of concessionary interest rates and other institutional constraints that exist in the farm credit markets have an effect on the demand for farm credit.
5. That the institutional constraints also give rise to lags in the demand for long term credit.

Method and Organization of the Study

Methodology

The demand for a commodity or service is determined by such factors as the price of the product, income of consumers, price of substitutes and complements, tastes and other factors that influence preferences. In this study, annual data from published sources were used to investigate the demand for farm credit in Canada from 1950 to 1975. The demand for farm credit was regarded as a derived demand for gross investment funds. Emphasis was thus placed upon the relationship between the determinants of investments and the demand for farm credit. The principal demand variables, namely income, and interest rates on borrowed funds were included in the models formulated for the study. In addition, costs, farm wealth,* and index of technological development and gross national

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* Farm wealth is here defined as the Total Value of Farm Assets.

expenditures were included in the models as principal determinants of the investment demand for farm credit.

A single equation multiple regression analysis was used to test the importance of the relevant factors for the short, intermediate and long term credits, respectively. Linear Double Logarithmic and First Difference equations were used in the investigation of the investment demand for all types of credits. Parameters obtained from the initial analysis were used to estimate wealth, income, interest, cost and output elasticities of demand for the different types of credit. In addition, the structure of the suspected lag on the long term markets is computed on the basis of the regression results. Implications and inferences drawn from the results so obtained are discussed with particular reference to agricultural credit policies and other related issues in the Canadian agricultural industry.

Organization

In Chapter I, the problem is introduced after a short background discussion. The objectives and the hypotheses of the study are presented. Chapter II describes the production environment of the farmer. The following section discussed trends in the farm credit markets and the institutional setting in which lenders and borrowers operate. In Chapter III, the theoretical background of the study is reviewed starting with a discussion of the concepts of supply, demand, and derived demand. This discussion is followed by a short review of investment theories. A literature review of other studies related to this thesis is presented. Chapter IV deals with the development of

regression models for the various credit markets based upon a derived demand for investment funds theory. A discussion of the sources and modification of the data used in the study is presented. In Chapter V, results of the statistical analysis are presented and a discussion of these results is provided. The limitations of the study are also discussed. In Chapter VI, a summary of inferences drawn on the basis of the study as it affects agricultural credit and other agricultural policies are presented and suggestions based upon the findings of the study are advanced.

CHAPTER II

FARM INVESTMENTS AND CREDIT IN CANADA

Introduction

In this Chapter, a discussion on the competitive dynamics of the agricultural economy is presented. Emphasis is placed on the response to changing trends in the agricultural production sector by farm operators. The sources of funds for farm investments are discussed including trends and developments in the various credit markets -- long, intermediate and short term.

Farm Organization, Structural Adjustments, and the Competitive Dynamics of the Agricultural Economy

Over the last three decades, the agricultural industry has been transformed into a capital intensive and labour replacing sector of the Canadian economy. The trend towards capitalization came about as a result of the introduction of improved techniques of production. Total farm output and the productivity of farm resources have increased as a direct consequence of this technological revolution. The technological developments in the farm sector sparked off a process of structural adjustment which has been reflected by a marked recombination of resources associated with production. Other important characteristics of the change include the reduction in the number of farm units as well as increased specialization in production.

Neither have these trends been the same for all regions and

TABLE 2.1

INDEXES OF OUTPUT, INPUTS AND PRODUCTIVITY (OUTPUT PER UNIT OF INPUT), CANADIAN AGRICULTURE, BY REGIONS, 1961 TO 1974 (1961=100)

Index by Region	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	Annual Growth Rates 1961-74	1962-74
															— percent —	
Farm Output																
Maritimes	100	101	100	100	100	106	106	108	108	104	103	99	97	104	.10	.03
Quebec	100	103	105	103	104	109	113	118	117	118	117	109	111	117	1.05	.94
Ontario	100	105	106	109	109	118	115	118	118	125	126	127	122	133	1.93	1.83
Prairies	100	160	168	161	181	212	164	184	197	161	207	191	205	184	2.84	1.10
British Columbia	100	110	113	119	109	127	126	124	117	130	135	130	140	131	1.98	1.71
CANADA	100	128	140	130	137	155	135	145	150	138	157	149	154	150	2.04	1.25
Production Inputs																
Maritimes	100	91	83	88	87	87	83	81	81	82	79	77	81	85	—1.17	—.82
Quebec	100	100	100	98	100	100	105	105	102	103	101	104	105	107	.48	.52
Ontario	100	100	106	106	107	108	113	112	113	113	114	113	117	117	1.16	1.06
Prairies	100	102	104	105	106	108	110	111	111	110	112	115	119	128	1.48	1.44
British Columbia	100	103	93	102	105	117	120	124	129	136	143	145	146	147	3.81	3.93
CANADA	100	101	102	104	104	105	109	109	109	109	111	113	115	118	1.17	1.16
Productivity																
Maritimes	100	111	120	114	115	122	127	133	133	127	130	129	120	132	1.29	.86
Quebec	100	105	105	105	104	109	108	112	115	115	116	105	106	109	.58	.42
Ontario	100	105	100	103	102	109	102	105	104	111	110	112	104	114	75	.72
Prairies	100	157	161	152	171	200	149	166	177	146	185	166	172	144	1.17	—.35
British Columbia	100	107	121	117	104	108	105	100	90	95	94	90	96	89	—1.73	—2.13
CANADA	100	127	137	125	132	148	124	133	137	127	142	132	134	127	.86	.07

Source: Canadian Farm Economics, Vol. 10, No. 6, (Dec. 1975)

TABLE 2.2

NUMBER OF FARMS IN CANADA, BY REGION AND ECONOMIC CLASS IN CONSTANT 1961 DOLLARS, 1961, 1966, & 1971

Region and	Farm Numbers[a]			Distribution of Farm Numbers by Economic Class			Rate of Change (1961=100) by Economic Class		
Economic Class	1961	1966	1971	1961	1966	1971	1961	1966	1971
	— number —			— percentage —			— percentage —		
Canada[b]									
less than $2,500	221,033	165,846	117,381	46.04	38.59	32.13	100.00	75.03	53.11
$2,500 – $4,999	118,775	86,296	65,525	24.74	20.08	17.94	100.00	72.66	55.17
$5,000 – $9,999	90,419	96,409	89,521	18.83	22.46	24.50	100.00	106.72	99.01
$10,000 and over	49,841	81,090	92,907	10.39	18.87	25.40	100.00	162.70	186.41
Total	480,068	429,731	365,334	100.00	100.00	100.00	100.00	89.51	76.10
Atlantic Provinces									
less than $2,500	24,058	17,791	9,412	72.21	67.56	55.34	100.00	73.95	39.12
$2,500 – $4,999	4,726	3,563	2,431	14.19	13.53	14.29	100.00	75.39	51.44
$5,000 – $9,999	2,892	2,851	2,544	8.68	10.83	14.96	100.00	98.58	87.97
$10,000 and over	1,638	2,129	2,620	4.92	8.08	15.41	100.00	129.98	159.95
Total	33,314	26,334	17,007	100.00	100.00	100.00	100.00	79.05	51.05
Quebec									
less than $2,500	56,655	41,528	23,300	59.27	51.83	38.10	100.00	73.32	41.13
$2,500 – $4,999	23,205	18,725	12,120	24.28	23.36	19.82	100.00	80.69	52.23
$5,000 – $9,999	11,851	13,289	14,565	12.40	16.59	23.80	100.00	112.12	122.92
$10,000 and over	3,871	6,594	11,179	4.05	8.22	18.28	100.00	170.09	288.79
Total	95,582	80,146	61,154	100.00	100.00	100.00	100.00	83.85	63.98
Ontario									
less than $2,500	51,573	41,951	32,513	42.54	38.20	34.36	100.00	81.34	63.04
$2,500 – $4,999	36,575	19,520	14,171	21.02	17.76	14.97	100.00	73.45	53.37
$5,000 – $9,999	23,501	23,432	21,650	19.71	21.34	22.89	100.00	96.04	90.62
$10,000 and over	19,190	24,902	26,294	15.83	22.60	27.78	100.00	129.77	137.02
Total	121,240	109,805	94,635	100.00	100.00	100.00	100.00	90.57	78.06
Prairie Provinces									
less than $2,500	76,991	53,598	41,958	36.66	27.57	24.09	100.00	69.62	54.50
$2,500 – $4,999	61,407	42,110	34,669	29.24	21.66	19.91	100.00	68.58	56.46
$5,000 – $9,999	49,232	54,440	48,235	23.44	28.01	27.69	100.00	110.58	97.97
$10,000 and over	22,396	44,241	49,309	10.66	22.76	28.31	100.00	197.54	220.16
Total	210,026	194,389	174,171	100.00	100.00	100.00	100.00	92.55	82.93
British Columbia									
less than $2,500	11,756	10,968	10,196	59.06	57.55	55.53	100.00	93.30	86.73
$2,500 – $4,999	2,861	2,378	2,134	14.37	12.48	11.62	100.00	82.11	74.62
$5,000 – $9,999	2,543	2,677	2,527	12.78	13.00	13.76	100.00	97.41	99.38
$10,000 and over	2,746	3,234	3,505	13.79	16.97	19.09	100.00	117.77	127.66
Total	19,057	19,057	18,364	100.00	100.00	100.00	100.00	95.73	92.26

Source: Canadian Farm Economics, Vol. 12, No. 5 (Oct. 1977)

TABLE 2.3

INDEXES OF MAJOR INPUTS, CANADIAN AGRICULTURE, BY REGION, 1961 TO 1974

Indexes & Region	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	Annual Growth Rates 1961-74	Annual Growth Rates 1952-74
															— percent —	
Real Estate																
Maritimes	100	101	102	102	103	100	93	93	90	93	89	93	96	97	−.78	−.84
Quebec	100	101	101	98	98	101	99	98	96	102	95	98	103	104	.03	.09
Ontario	100	100	101	101	102	103	105	106	106	104	101	102	102	106	.28	.24
Prairies	100	101	101	101	103	103	107	110	111	116	118	119	121	126	1.90	2.02
British Columbia	100	104	104	107	113	121	132	142	151	163	168	179	188	193	5.61	6.03
CANADA	100	101	101	101	102	103	106	109	108	114	115	117	119	124	1.58	1.78
Labor																
Maritimes	100	80	82	69	82	58	53	47	47	47	42	35	36	40	−6.68	−6.02
Quebec	100	96	90	83	84	77	83	83	78	75	71	70	64	62	−3.12	3.03
Ontario	100	98	100	99	93	86	91	88	84	82	83	72	75	74	−2.67	2.32
Prairies	100	105	100	95	91	83	81	77	81	75	77	76	72	76	−2.09	2.71
British Columbia	100	100	97	82	82	93	93	96	85	85	93	82	78	74	−.86	.49
CANADA	100	97	95	92	87	80	82	80	78	75	75	70	68	69	−2.75	2.94
Capital (All other inputs)																
Maritimes	100	101	104	106	114	120	118	120	123	124	124	127	134	140	2.42	2.40
Quebec	100	104	109	112	116	122	120	126	130	131	133	141	147	153	3.04	2.95
Ontario	100	100	108	114	120	126	132	132	135	139	141	146	153	152	3.51	3.32
Prairies	100	104	109	116	122	132	138	141	135	136	138	145	158	176	3.83	3.56
British Columbia	100	104	108	116	120	136	136	135	152	162	170	177	176	178	4.99	4.96
CANADA	100	104	110	116	121	129	136	137	138	138	140	146	155	158	3.39	3.23

Provinces of Canada nor has it been the same for the different income classes of farmers and regions. Studies on this subject by Shute,[1] Jones and Tung [2] have revealed, however, that the trend has ben similar for all classes and in all regions of Canada.

These changes have been assisted and promoted directly and indirectly by several Provincial and Federal government policies and programs. These programs include research and extension work such as the Small Farm Development program and the Prairie Rehabilitation Administration which have been used as measures to help increase farm efficiency and incomes.[3]

Owing to the slow growth in the domestic demand for agricultural products and the unfavourable trends in the international markets for agricultural products (especially in recent years), the large and rapid increases in the total output in the last three decades has resulted in an overproduction of farm products.[4] The persistence of surplus production caused a decline in the prices of agricultural products

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[1] D.M. Shute, "National and Regional Productivity of Canadian Agriculture, 1961-1974", Canadian Farm Economics, Vol. 10, No. 6, December, 1975, Economics Branch, Canada Department of Agriculture.

[2] W.D. Jones, and F. Tung, " A Regional Comparison of Structural Change and Resource Use in the Canadian Farm Industry, 1961 to 1971, " Canadian Farm Economics, Vol. 12, No. 5, Oct. 1977, Economics Branch, Canada Department of Agriculture.

[3] Ibid.

[4] W.J. Anderson, "Policy Alternatives for Canadian Agriculture," Canadian Farm Economics, Vol. 7, No. 2, June 1972, Economics Branch, Canada Department of Agriculture.

on the whole. The continuation of this phenomenon caused farm incomes not only to fluctuate over the years but also to decline in real terms in the last few years. The reduction and fluctuations in income have caused (especailly the low and middle income) farm operators to seek off-farm employment to supplement their incomes in order to be able to meet part of their consumption and investment needs.

In this study, farm investments include short, medium and long term investments. Short term investments are here defined as those production supplies which are used in the running operations on the farm and whose life span end with each production period. Herbicides, feed, fertilizers, and fuel are examples of such supplies classified as short term. Medium term investments are employed in the production process over more than one session and their values depreciate over the years. Farm machinery and implements are in this category. Long term investments are those production inputs that have a life span of over ten years and include the farm land and the sturctures on the farm. Investments in farm inputs have been increased rapidly in order that the technological innovations might be used more economically and the scale effects which they promise be captured. A similar observation has been made by Jones and Tung.

> "Farm investments have increased by 3 billion dollars from 1961 to 1971, despite the disappearance of 114,734 farms. Land value increases of 2.2 billion dollars accounted for most of the increase, followed by the purchase of high capacity machinery which accounted for $466 million." 5

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[5] W.D. Jones and F. Tung, op. cit.

FIGURE 2.1

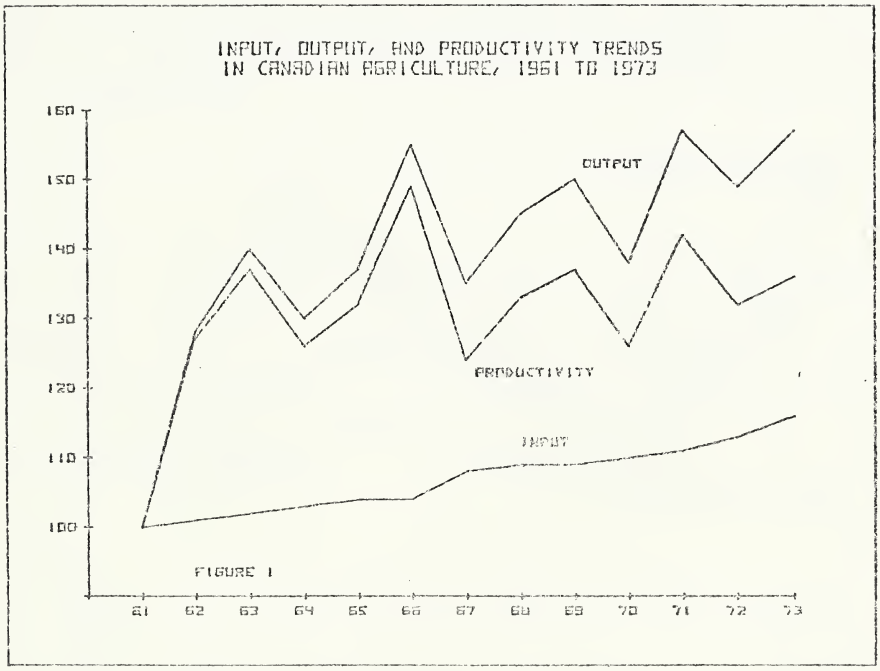
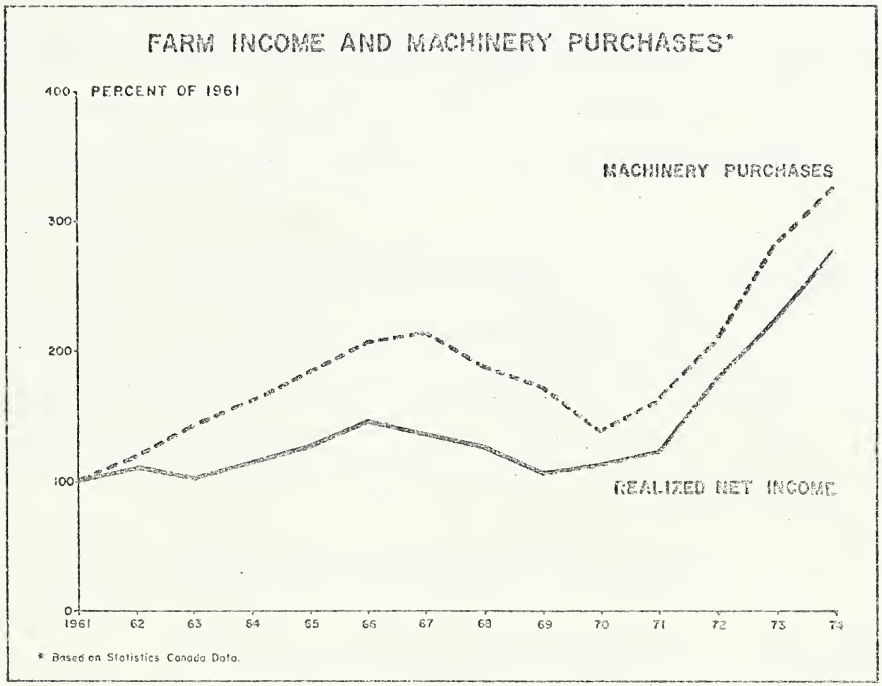

INPUT, OUTPUT, AND PRODUCTIVITY TRENDS
IN CANADIAN AGRICULTURE, 1961 TO 1973
160
150
140
130
120
110
100
OUTPUT
PRODUCTIVITY
INPUT
FIGURE 1
61
62
63
64
65
66
67
68
69
70
71
72
73

FIGURE 2.2


FARM INCOME AND MACHINERY PURCHASES*
PERCENT OF 1961
400
300
200
100
0
MACHINERY PURCHASES
REALIZED NET INCOME
1961
62
63
64
65
66
67
68
69
70
71
72
73
74
* Based on Statistics Canada Data.

This trend has continued in the same fashion until the present. Even though the statement above does not mention farm supplies like fertilizers etc., it is quite evident that the expansion in the land base and the procurement of high capacity machinery and implements would have to be combined with an increasing amount of other input supplies if scale effects are to be gained in the production process.

Investment needs can be met from two sources, equity and debt financing. As has been mentioned in Chapter I, an increasing proportion of investment needs are met with farm credit. The total value of farm credit extended from 1950 to 1975, increased from $499.4 million to $5413.4 million. This trend has been similar to the growth of farm investment.

This section has attempted to describe the competitive dynamics of the Canadian farm business and has indicated the importance of farm investments. Next, the trends, sources of, and uses of farm credit will be discussed.

Sources and Uses of Farm Credit in Canada

The discussion in the previous section has indicated that the principal agent behind the rapid structural adjustments, increased productivity of resources and total output which has taken place in Canadian agriculture is capital investment. In this context, therefore, changes in, and timing of investment, can be regarded as crucial to the development of the farm sector. As has been mentioned before, investment

TABLE 2.4

OFF-FARM WORK OF FARM OPERATORS IN CANADA, BY PROVINCE AND ECONOMIC CLASS IN CONSTANT 1961 DOLLARS 1961, 1966, & 1971

Region and Economic Class	Total			Average Per Farm		
	1961	1966	1971	1961	1966	1971
	-- thousand days --			-- days --		
Canada						
less than $2,500	16,936	14,894	11,481	76.6	89.8	96.8
$2,500 – $4,999	3,428	3,917	3,680	28.9	45.4	55.7
$5,000 – $9,999	1,559	2,681	2,939	17.2	27.7	33.1
$10,000 and over	737	1,494	1,836	14.8	18.5	20.3
Total	22,660	22,986	19,936	47.2	53.5	54.6
Atlantic Provinces						
less than $2,500	2,167	1,601	994	90.1	90.0	93.9
$2,500 – $4,999	172	166	130	36.4	46.7	53.6
$5,000 – $9,999	76	92	81	26.3	32.2	31.8
$10,000 and over	39	49	49	23.8	23.0	18.7
Total	2,454	1,908	1,144	73.7	72.5	67.2
Quebec						
less than $2,500	4,015	3,428	1,762	70.9	82.5	76.6
$2,500 – $4,999	593	830	506	25.6	44.3	41.7
$5,000 – $9,999	184	372	362	16.5	27.9	24.8
$10,000 and over	63	133	189	16.3	20.3	16.9
Total	4,855	4,763	2,819	50.8	59.4	46.1
Ontario						
less than $2,500	5,065	4,661	3,977	98.2	111.1	122.3
$2,500 – $4,999	1,112	1,262	1,223	41.8	64.6	86.3
$5,000 – $9,999	553	895	1,038	23.1	38.2	47.9
$10,000 and over	335	608	743	17.5	24.4	28.2
Total	7,065	7,426	6,981	58.3	67.6	73.5
Prairie Provinces						
less than $2,500	4,227	3,826	3,543	54.9	71.4	84.4
$2,500 – $4,999	1,356	1,477	1,630	22.1	35.1	47.6
$5,000 – $9,999	657	1,200	1,327	13.3	22.0	27.9
$10,000 and over	245	618	758	10.9	14.0	15.4
Total	6,485	7,121	7,258	30.9	36.6	41.7
British Columbia						
less than $2,500	1,458	1,378	1,315	124.0	125.7	129.0
$2,500 – $4,999	196	182	191	68.5	76.7	89.6
$5,000 – $9,999	89	122	131	35.0	49.4	51.8
$10,000 and over	55	86	97	20.0	26.5	27.7
Total	1,798	1,768	1,734	90.3	92.8	94.4

[a]Figures in the 1966 and 1971 years were adjusted based on the procedures presented in the Appendix. Days of off-farm work by institutional farm operators and by farm operators in the Yukon and Northwest Territories were excluded.

Source: Compiled from the Agriculture Census years 1961, 1966, and 1971.

needs can be met from two sources, equity and debt financing. Debt financing which represents external funding includes farm credit supplied by both government and private lending agencies. There has been an increase in the demand for and supply of farm credit in Canada and there is no indication as to a possible reversal of this trend. The growth in demand for farm credit is very much related to the increase in investment.

The credit market is composed of three different markets namely, the short, intermediate and long term markets. Following Rust, short term loans are here defined as those which have a repayment period of up to 18 months. Intermediate term loans have a repayment period between 18 months to 10 years.[6] This differentiation is related basically to the different terms of financing, the repayment periods associated with the loans and also the end uses of the loan. Estimated debt outstanding on all credit extended increased from $786 million to $8118.9 million. This represents 10.97 and 10.33 times increase in credit extended and credit outstanding respectively. The debt ratios increased from 0.95 in 1949 to 1.91 in 1975. Nearly 80 percent of the total amount of credit extended originates from private sources with the remainder coming from government or quasi-government institutions.

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[6] See for example R.S. Rust, " Farm Finance", Canadian Farm Economics, Vol. 11, No. 6, December 1976, Economics Branch, Canada Department of Agriculture.

TABLE 2.5

ESTIMATED FARM CREDIT EXTENDED, CANADA, 1960 AND 1968 TO 1972[a]

Source and Term of Credit	Estimated farm credit extended						Estimated average interest rate	Estimated average interest rate	Percent of credit extended by source
	1960	1968	1969	1970	1971	1972	1971	1972	1972
	— millions of dollars —						— percent —		
LONG-TERM (more than 10 years)									
Farm Credit Corporation	52.3	205.3	153.0	116.5	109.7	156.0	7.7	6.7	5.2
Veterans' Land Act	19.4	20.1	17.9	10.5	20.6	11.4	7.7	6.7	0.4
Provincial government agencies	37.0	60.4	42.8	42.4	47.2	36.9	3.8	5.2	1.2
Private individuals	7.0	15.0	17.0	20.0	23.0	17.0	7.0	7.0	0.6
Insurance, trust and loan companies	3.0	13.0	7.0	5.0	3.0	5.0	10.7	10.5	0.2
Treasury Branches (Alberta)	1.6	1.0	1.0	0.8	1.7	3.7	8.5	9.0	0.1
Alberta Electrical Co-operatives	2.0	2.0	2.0	1.6	1.8	1.9	3.5	3.5	0.1
Total long-term	122.3	316.8	245.7	196.8	206.0	231.9	6.6	6.8	7.8
INTERMEDIATE-TERM (18 months to 10 years)									
Banks (FILA)	101.9	40.2	142.0	103.0	147.4	177.9	7.0	6.6	6.0
Banks (other than FILA)	—	—	20.0	30.0	55.0	65.0	7.2	8.4	2.2
Private individuals	75.0	130.0	144.0	148.0	146.0	151.0	7.0	6.7	5.1
Supply companies	29.0	35.0	31.0	40.0	51.0	144.3	14.5	14.9	4.8
FCC (loans to farm syndicates)	—	1.7	2.9	1.8	1.9	1.9	6.9	6.2	0.1
Insurance, trust and loan companies	0.5	5.0	7.0	8.0	10.0	27.0	11.9	10.5	0.9
Industrial Development Bank	—	8.4	9.5	9.5	11.4	16.5	9.5	9.5	0.6
Credit Unions	4.0	70.0	40.0	63.0	82.4	90.1	9.1	9.0	3.0
Municipalities (Ontario Tile Drain Act)	1.0	4.3	5.1	5.8	5.9	4.7	4.0	4.0	0.2
Finance companies (cars and trucks)	5.0	15.0	11.0	9.0	13.0	16.0	13.5	11.0	0.5
Treasury Branches (Alberta)	0.2	3.3	3.0	2.1	4.4	6.9	7.5	8.2	0.2
Total intermediate-term	216.7	311.9	415.5	420.2	528.4	701.3	8.3	9.1	23.6
SHORT-TERM (up to 18 months)									
Banks (other than FILA)	302.0	995.0	990.9	1,120.0	1,314.0	1,404.0	8.2	7.8	47.2
Supply companies	237.0	300.0	219.0	203.0	275.0	269.2	15.0	11.0	9.0
Credit Unions	55.0	187.0	116.0	109.0	134.4	163.6	9.4	9.2	5.5
Finance companies (household and personal)	6.0	12.0	13.0	9.0	12.0	14.0	18.0	16.0	0.5
Dealers, stores, etc.	23.0	14.0	12.0	9.0	10.0	10.0	16.0	14.0	0.3
Private individuals	55.0	105.0	115.0	120.0	105.0	104.0	7.0	7.0	3.5
Treasury Branches (Alberta)	8.0	17.1	19.0	22.0	24.7	27.4	7.0	7.0	0.9
Sedac (Saskatchewan)	—	0.6	4.8	0.5	1.2	1.3	9.6	8.4	0.1
Co-operative programs	—	17.3	19.0	24.0	30.0	49.1	9.6	10.4	1.6
Totals Short-term	686.0	1,548.5	1,507.7	1,622.5	1,906.3	2,042.6	9.3	8.4	68.6
Total all credit	1,030.0	2,177.2	2,168.9	2,239.5	2,640.7	2,975.8	8.9	8.5	100.0

[a]For years 1961 to 1967 see R.S. Rust, A Review of Farm Credit and Farm Income Relationships, Canadian Farm Economics, Vol. 5, No. 2, June 1970.

Short Term Credit

Most farmers use short term credit for the purchase of variable inputs such as fertilizer, feed, herbicides etc. In addition, short term credit is used by farmers to meet consumption needs and also to tie them over till they have cleared their inventories. These latter examples seem to indicate that an increase in the income of farmers will have a negative effect on demand for short term credit.

The bulk of short term credit is supplied by private lending agencies. These include Commercial banks, supply compnies, credit unions, finance companies (household and personal), dealers, private individuals, cooperatives, treasury branches in Alberta, Sedco in Saskatchewan. Government influence is almost non-existent in this sector of the agricultural credit market. In 1950, 65.93 percent of the total amount of credit extended was short term credit. In 1975, it accounted for 65.76 percent of the total estimated credit extended. The increasing amount of total credit attests to the expansion and intensification of production in the farm sector. It has also resulted mainly because of the increase in the cost of inputs over the years. Commercial banks, supply companies, credit unions, dealer stores, and private individuals supply 94.72 percent of the total short term credit in 1972. This figure has not changed much since 1960 when 96.60 percent was supplied by these smae sources. Interest rates on short term credit have exhibited the same trend as the total amount extended. The estimated interest rates on short term credit from all sources have increased over the years in response to the effects of inflation and the increase in risk associated

with growing amounts of funds loaned out. As a result of these phenomena interest rates on borrowed funds have also increased. There is a wide disparity in interest rates between different lending agencies. In 1974, interest rates ranged from 8.5 under loans made by private individuals to 20 percent by Finance companies. This reflects to a large extent the difference in the cost of money and the risk valuation of loanable funds by different lending agencies. The weighted interest rates for short term credits in 1974 was 12.2 percent, and it was the highest weighted interest rates for all types of farm credit.

Intermediate Term Credit

Intermediate term credit is employed mainly in the purchase of farm machinery, implements, and breeding stock used for periods of more than one year. The value of these items depreciate over time due to deterioration and obsolescence caused by the introduction of new techniques of production. Investment in these inputs, therefore, depends very much on the rate of depreciation over the years. A study by Book[7] indicates that investment in farm machinery and spares is very highly correlated with the realized net income of farmers. A close look at the figures presented in this study reveals, however, that farm machinery sales have not slackened significantly in times when the realized net farm income had declined. (See figure 2). The upshot of

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[7] A.N. Book, "Farm Machinery", Canadian Farm Economics, Vol. 11, No. 6, December 1976, Economics Branch, Canada Department of Agriculture.

this observation is that farm machinery investments have been made with the help of off-farm and non-farm funding which includes intermediate term credits even though farmers traditionally made investments from equity sources.

A significant amount of intermediate term credit is supplied by private lending agencies with the various governments serving as guarantors. Agencies in this market include Commercial banks operating under the Farm Improvements Loans Act (FILA). Under this Act, the Federal Government of Canada, through the Department of Finance "serves as a guarantor against loss, term loans made to farmers by Chartered banks, and other lenders designated by the Minister, for a wide range of farm improvement projects".[8] Other participants in the intermediate credit market include Chartered banks not operating under the Farm Improvement Loan Act, Private individuals, Supply companies, Farm Credit Corporation loans to farm syndicates under the Farm Syndicates Act, Insurance, Trust and Loan Companies, Industrial Development Bank loans under the small Business Development Act, Credit Union loans under the Credit Union Act,[9] Finance companies (cars & trucks), and the Treasury Branches of Alberta.

Governmental influence is evident in the organization and the working of this sector of the credit market even though it is not direct. The estimated amount of intermediate term credit extended increased from

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[8] Farm Improvement Loans Act, Federal Agricultural Legislation Up to 1975, Economics Branch, Canada Department of Agriculture, Publication No. 75/1.

[9] For a complete account of these Acts, see Farm Improvement Loans Act, op. cit.

102.4 million dollars in 1950 to 1199 million dollars in 1975. In 1950, the estimated intermediate term credit formed 20.5 percent of the total amount of all credit extended. In 1975, it accounted for 22.1 percent of the total -- a slight increase in the share of estimated total credit.

An appreciable share of the total credit supplied on the intermediate term credit market in 1974 was from Chartered banks under FILA, private individuals, Supply companies, Credit Unions, and other Chartered banks not under FILA. On the whole, however, this has not represented a major change in the market structure of the intermediate term credit market of agriculture.

One of the important determinants of intermediate term investments is the costs of farm implements, machinery and spare parts. This effect is translated on the credit market as an increase in the demand for this kind of credit, especially because of the fluctuating farm incomes and persistent inflationary pressures on the Canadian economy as a whole. Estimated interest rates on intermediate term credit from all sources have increased over the last three decades in response to the general increase in the level of prices in the general economy. A significant range exists in the interest rates charged on borrowed funds. In 1974, it ranged from 4.0 percent on loans made under the Ontario Tile Drain Act to 15.5 percent by Supply companies. Generally, interest rates rates on Government assisted or guaranteed loans were lower than those supplied by the private agencies. Weighted interest rates on intermediate term credit are the second highest interest rates after short term rates in the agricultural credit market.

Long Term Credit

Long term credit is used mainly for investment in real estate. On the average, over the years, it has accounted for just over 10 percent of the estimated total amount of farm credit extended in Canada. The value of these inputs have appreciated over the last three decades. Agricultural production depends mainly on the land resource. Land serves as an important collateral on the credit market. Because of the competitive nature of the farm business, farmers have sought to improve their competitiveness and have seized any opportunity to invest in new technology. This has in turn created the need to expand the size of farms. Because of the cost-price squeeze which has affected the earning capabilities of farmers, and owing to the very large sums needed for investment in land, many farmers have turned to the credit markets.

Most of the long term credit for agricultural production is supplied by Government agencies -- both Federal and Provincial -- under different programmes. Agencies involved in long term agricultural credit supply include the Farm Credit Corporation, which operates under the Farm Credit Act, Veterans' Land Act, the Farm Improvement Loans Act, the Farm Syndicates Credit Act.[10] Others include Provincial government agencies, private individuals, Insurance, Trust and Loan Companies.

The total estimated amount of long term credit extended in 1950 increased from 66.10 million dollars to 654.4 million dollars in 1975. In 1975, the total amount of long term credit formed about 12

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[10] Farm Credit Corporation, Annual Report, 1975-1976

percent of all credit to the farm sector. More than 80 percent of the estimated long term credit in 1975 originated from government lending agencies, the most important being the Farm Credit Corporation with a major market share of about 60 to 65 percent. The trend has not changed much since 1960 when the Farm Credit Corporation was created. The evidently high level of government involvement in this highly concentrated and risky sector of agricultural lending dates back to the depression years, 1930-1940 and the years immediately following the Second World and the Korean Wars. The serious losses incurred by private lending agencies, farm operators, and other businessmen in the agricultural sector during these depression years coupled with the characteristically low growth rate in demand and the relatively low rate of return on farm investments as compared to other sectors of the economy, resulted in a reduced participation in the long term credit market by private agencies. Added to these factors was the need to assist and establish landless and interested war veterans in the agricultural production sector. In order to promote and sustain efficient farm productivity and prospects, the Federal Government set up the Canada Farm Loan Board in 1944 to help alleviate the problems faced by farmers in obtaining farm credit under the Farm Credit and Veterans' Land Acts. In addition, all the Provincial governments are involved in long term financing of the agricultural industry, to different extents.[11]

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[11] R.S. Rust, "Farm Finance", Canadian Farm Economics, Vol. 11, No.6, December, 1976, Economics Branch, Canada Department of Agriculture.

Another development in recent years seems to indicate a declining supply of long term funds for agriculture from Insurance, Trust and Loan companies. Total estimated amount of credit from these sources declined from 49.0 million dollars in 1972 to 29.0 million dollars in 1975. In addition to the dominant role of government agencies in the long term credit markets for agriculture, another important characteristic of this market is that loans made by government agencies are made at concessionary interest rates in a bid to attract more investors into the farm sector. These rates are significantly lower than that on the private mortgage markets. In 1974, the interest rates charged on government funds was at an average of 7.3 percent while that on loans from Insurance, Trust and Loan companies was 13.5 percent. This spread between government and private interest rates to some extent, represents the amount of subsidy paid by government.

Yet another characteristic of this sector of the farm credit market is the mode of supply of loans. Each year, a total amount of loanable funds are voted towards long term financing by the various governments, depending upon the general state of the economy. Loans are supplied from these sources until they become exhausted and then the borrower has to wait for the next season or otherwise turn to the private markets.

There are several limitations and restrictions associated with long term funding, examples being the fixed loan limits on long term credits and age restrictions on borrowers. Investment of government in the credit market, the supply of credit at concessionary interest rates and the several other restrictions associated with long term

funding has invited comments from several writers. The crux of the matter seems to be centred around the continued mode of involvement of government in the credit market. Several points both for and against governmental involvement have been advanced on this point.[12]

Indebtedness in the Farm Sector

The debt structure of an industry or firm in relation to its assets, resource productivity, expected costs and revenues, is a measure or a standard by which its stability and credit worthiness can be assessed currently and for the future. This section discussed briefly indebtedness in the Canadian farm sector and its possible implications.

Estimated debt outstanding on short term credit increased from 290.8 million dollars in 1950 to 3004 million dollars in 1975. Debt on intermediate term credit increased from 310.4 million dollars in 1950 to 2733.4 million dollars in 1975, long term credit from 238.1 million dollars to 3409.9 million dollars over the same period of time. The structural organization of the credit market indicates, therefore, that nearly one-third of all farm debts are carried by government agencies, since the bulk of long term farm credit is supplied by these agencies.

The debt asset ratio as well as the total debt asset ratio have increased. The former has been higher than the latter because

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[12] H.D. McRorie, "Facing the Land Financing Crisis", Paper presented at the 4th Annual Canadian Bankers' Association Farm Credit Conference, Regina, (October 27, 1976.) See also:

J.R. Brake, op. cit.

W.F. Lee, op. cit.

M.E. Andal, op. cit.

TABLE 2.5

ESTIMATED FARM CREDIT OUTSTANDING 1972-75, INTEREST RATES, INTEREST CHARGES AND DISTRIBUTION OF DEBT BY SOURCE

Source and term of credit	Estimated farm credit outstanding				Estimated average interest rate			Estimated Total interest charges			Percent outstanding by source	
	1972	1973[a]	1974[a]	1975[b]	1973[a]	1974[a]	1975[b]	1973[a]	1974[a]	1975[b]	1974[a]	1975[b]
	— millions of dollars —				— percent —			— millions of dollars —			— percent —	
LONG-TERM (10 years and over)												
Farm Credit Corporation	1,229.1	1,443.7	1,684.6	1,930.2	6.2	6.6	7.0	78.54	97.65	121.69	24.5	23.8
Veterans' Land Act	147.2	142.0	133.8	105.4	6.1	6.4	7.5	8.66	8.56	7.91	1.9	1.3
Provincial Government agencies	404.6	416.5	517.3	563.6	4.7	4.9	5.1	19.53	25.35	28.74	7.5	6.9
Private individuals	72.0	83.0	84.0	114.0	6.3	6.7	7.0	5.23	5.63	7.98	1.2	1.4
Insurance, trust & loan companies	46.0	35.0	29.0	24.0	10.1	10.4	10.8	3.54	3.02	2.59	0.4	0.3
Treasury Branches (Alberta)	5.0	–	–	–	–	–	–	–	–	–	–	–
Alberta Electrical Co-operatives	13.7	13.2	14.6	16.7	3.5	3.5	3.5	0.46	0.51	0.58	0.2	0.2
Total long-term	1,917.6	2,132.4	2,463.3	2,753.9	5.5	5.7	6.2	116.96	140.72	169.49	35.7	33.7
INTERMEDIATE-TERM (18 months to 10 years)												
Banks (FILA)[c]	374.0	446.1	447.0	470.0	7.2	8.0	8.7	32.12	35.76	40.89	6.5	5.8
Banks (other than FILA)	80.0	263.0	404.0	437.0	10.6	11.3	11.0	27.88	45.65	48.07	5.8	5.4
Private individuals	547.0	629.0	690.0	850.0	6.9	8.0	7.5	43.40	55.20	63.75	10.0	10.5
Supply companies	185.2	145.7	220.0	362.0	14.9	15.2	15.3	21.71	33.44	55.39	3.2	4.4
FCC (farm syndicate loans)	6.7	7.8	11.1	12.3	6.9	7.3	7.5	0.67	0.47	0.87	0.2	0.2
Insurance, trust & loan companies	32.7	51.0	49.0	48.0	11.2	13.0	12.0	5.72	6.37	5.76	0.7	0.6
Federal Business Development Bank	42.0	50.0	70.0	84.0	9.4	10.6	11.0	4.70	7.42	9.24	1.0	1.0
Provincial Government agencies	–	5.0	5.8	6.1	7.0	8.0	7.8	0.35	0.46	0.47	0.1	0.1
Credit unions including FILA	110.0	251.6	355.4	347.9	9.9	10.6	11.3	24.91	37.67	39.31	5.2	4.3
Municipalities (Ontario Tile Drainage)	24.4	29.2	37.6	48.9	4.0	4.0	4.0	1.17	1.51	1.96	0.5	0.5
Finance companies (cars and trucks)	23.0	18.0	25.0	24.0	13.2	13.4	14.2	2.38	3.35	3.41	0.4	0.3
Treasury Branches (includes FILA)	6.7	32.8	40.6	43.2	10.6	10.7	11.1	3.48	4.35	4.80	0.6	0.5
Total intermediate-term	1,431.7	1,929.3	2,365.5	2,733.4	8.7	9.6	10.0	168.39	231.65	273.92	34.2	33.7
SHORT-TERM (up to 18 months)												
Banks (other than FILA)	1,116.0	1,294.0	1,444.0	1,811.0	10.5	11.0	11.3	135.87	158.84	204.64	21.0	22.3
Supply companies	185.2	137.0	180.0	200.0	14.0	15.5	15.5	19.18	28.30	31.00	2.8	2.4
Credit unions	259.0	186.3	218.4	373.9	10.7	11.7	12.2	20.25	25.55	45.52	3.2	4.6
Finance companies (household & personal)	12.0	8.0	7.0	5.0	19.0	18.0	18.0	1.52	1.26	0.90	0.1	0.1
Dealers, stores, etc.	8.5	6.0	8.0	6.0	15.0	15.0	14.0	0.90	1.20	0.84	0.1	0.1
Private individuals	86.0	95.0	100.0	130.0	8.0	9.5	9.2	7.60	10.35	11.96	1.5	1.5
Treasury Branches (Alberta)[d]	28.4	52.7	71.4	79.4	10.0	10.0	11.1	5.27	7.14	8.81	1.0	1.0
Provincial Agencies	2.6	0.4	1.2	1.1	9.0	9.0	10.8	0.04	0.11	0.12	0.0	0.0
Co-operative programs	30.4	20.0	14.2	14.9	8.5	8.5	8.8	1.70	1.21	1.31	0.2	0.2
Unpaid taxes	7.6	7.0	7.9	10.3	9.9	10.5	11.0	0.72	0.83	1.13	0.1	0.1
Total short-term	1,735.9	1,800.7	2,070.1	2,631.6	10.7	11.4	11.6	193.05	235.79	306.03	30.1	32.4
Total all credit	5,085.2	5,871.4	6,588.9	8,118.9	8.1	8.8	9.2	478.40	608.16	749.74	100.0	100.0

[a]Revised
[b]Preliminary
[c]Total FILA outstanding $486 million
[d]Includes some intermediate-term

Source: Canadian Farm Economics, Vol. 11, No. 6

TABLE 2.7

THE RATIO OF FARM DEBT TO FARM INVESTMENT, CANADA 1960 TO 1974

Year	Farm debt	Investment in farm real estate, machinery and livestock[a]	Debt in relation to real estate machinery, and livestock investment	Estimated total investment of farmers	Debt in relation to total investment
	— millions of dollars —		— percent —	— millions of dollars —	— percent —
1960	1,583.0	12,680.0	12.5	14,098.9	11.2
1961	1,785.1	13,159.2	13.6	14,621.3	12.2
1962	2,017.8	13,669.7	14.8	15,183.6	13.3
1963	2,297.6	14,508.5	15.8	16,120.6	14.2
1964	2,613.3	15,744.1	16.6	17,493.4	14.9
1965	3,004.4	17,217.8	17.4	19,130.9	15.7
1966	3,444.2	19,062.7	18.1	21,180.8	16.3
1967	3,950.7	21,069.2	18.8	23,410.2	16.9
1968	4,104.8	22,700.5	18.1	25,222.8	16.3
1969	4,424.8	23,507.5	18.8	26,119.4	16.9
1970	4,489.7	23,801.0	18.8	26,445.6	16.9
1971	4,714.3	23,886.4	19.7	26,540.4	17.8
1972	5,085.2	25,177.8	20.2	27,975.3	18.2
1973	5,861.9	29,520.2	19.9	32,800.2	17.9
1974	6,741.2	36,049.1	18.7	40,054.6	16.8

[a]Source: Quarterly Bulletin of Agricultural Statistics, Cat. No. 21-003, Dominion Bureau of Statistics. (Excludes Newfoundland, Yukon and Northwest Territories.)

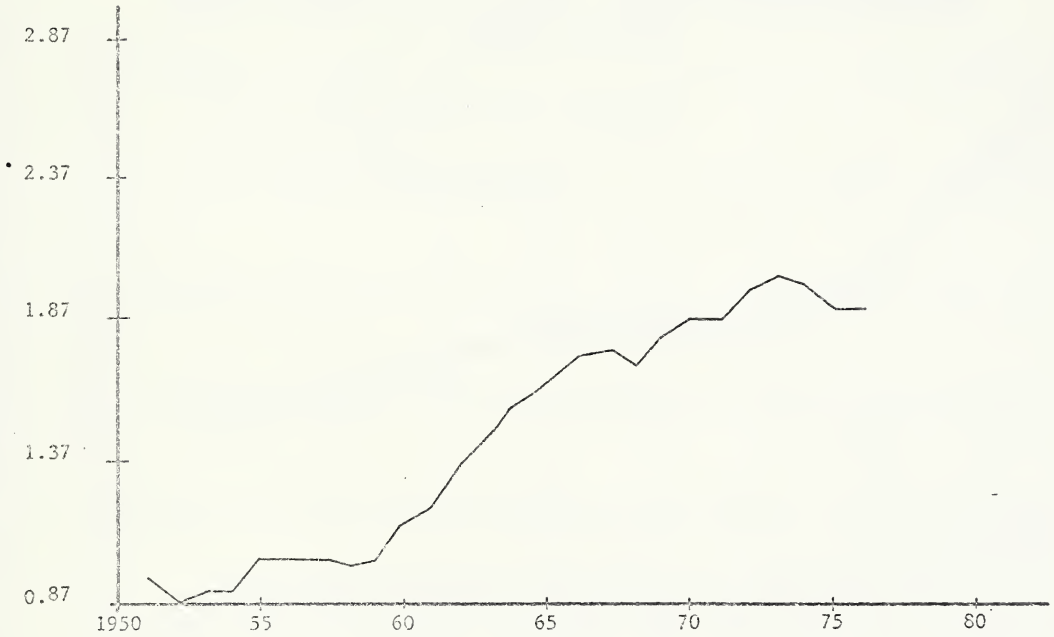
FIGURE 2.3

RATE OF RETURN ON FARM INVESTMENTS *

*Based on Statistics Canada Data

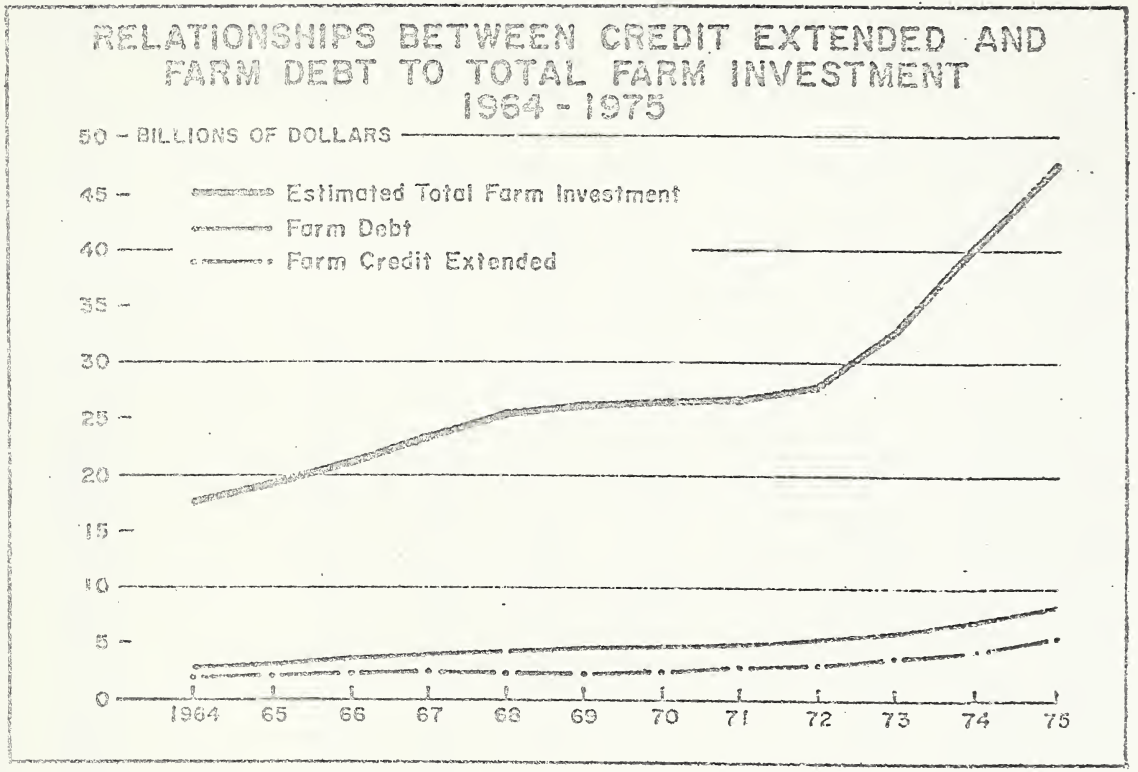
FIGURE 2.4

DEBT ÁSSET RATIO OF THE FARM SECTOR *



* Based on Statistics Canada Data

FIGURE 2.5


RELATIONSHIPS BETWEEN CREDIT EXTENDED AND FARM DEBT TO TOTAL FARM INVESTMENT 1964 - 1975
50 - BILLIONS OF DOLLARS
45
40
35
30
25
20
15
10
5
0
Estimated Total Farm Investment
Farm Debt
Farm Credit Extended
1964
65
66
67
68
69
70
71
72
73
74
75

of the high value of real estate, especially over the last five years when farm prospects increased significantly.

Debt repayment has been encouraging on the whole. A few low and middle income farmers have shown some stress in their repayment ability, however. A continuing decline in farm incomes has occurred since 1975. The phemenon had a dampening effect on the demand, especially for short term credit and debt obligations have not been met by some farmers. During this period of stress, lenders have helped farmers overcome their problems by rescheduling their debts.[14] Farm incomes have not shown any signs of improving both now and in the near future. Coupled with the increasing debt asset ratio in a sector which is generally associated with higher risks than those in most other sectors of the economy and the growing inability of farmers to meet their debt obligations as a result of decreasing revenues, doubts have been raised concerning the credit worthiness of the farm sector. Some writers have cautioned against this growing indebtedness and its possible effects on the agricultural sector and of the introduction and support of inefficient farm units in the farm sector under the guise of saving the family farm.[15,16]

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[14] R.S. Rust, op. cit.

[15] E. Melichar, "Some Current Aspects of Agricultural Finance and Banking in the United States", American Journal of Agricultural Economics, Vol. 55, No. 5,(December 1977.)

[16] J.R. Brake, "An Assessment of the Credit Recommendations of the Federal Task Force on Agriculture", Canadian Journal of Agricultural Economics,Vol. 19, No. 2,(October, 1971.)

CHAPTER III

THEORETICAL BACKGROUND OF THE STUDY

Introduction

In the first Chapter, the background of the study was developed. Chapter II discussed the structural changes and adjustments which have occurred in the farm sector as a result of the technological developments in the farm sector. The relationship between the increasing trends towards structural reorganization in the farm sector and the growth in farm investment was discussed. Also, the link between farm investments and the demand for farm credit was pointed out. Some of the factors which caused an increase in the demand for farm credit was also discussed.

In this Chapter, the theoretical basis for the study will be discussed in an attempt to establish a relationship between the demand for credit and the demand for investment. After the review of investment theories, a short survey of previous work related to this study is discussed with emphasis on the assumptions underlying the methods used in those studies. The approach suggested for this study will then be discussed to bring out the differences between the reviewed methods and the present approach.

The Concepts of Demand and Supply

The demand for a commodity or service is the potential quantities of the commodity or service that would be taken by buyers away

from the market at a particular time and place at different prices. The supply of a commodity or service is also defined as the potential quantities of the commodity or service offered by sellers on the market at a particular time and place at different prices.[1] Markets, therefore, facilitate trading between buyers and sellers.

Equilibrium prices in the market are determined by the supply and demand relationships. The characteristics of supply and demand depend upon their determinants. These include the price of the commodity or service, income of consumers, price of substitutes and complements and other factors that influence tastes and preferences of consumers. The supply of a commodity or service is determined by the price of the commodity or service, level of technology, cost of production and all other factors that affect the costs of production. In farm production, weather, and diseases are examples of such factors.

Elasticity is a useful concept employed in the analysis of demand and supply functions in relation to their determinants. Elasticity values are used to estimate the responsiveness of consumers (demand elasticity) and suppliers (supply elasticity) to changes in their determinants. The price elasticity of demand and supply for a commodity is the percent change in the quantity demanded or supplied as a result of a percent change in the price of the commodity or service. A high price elasticity value indicates that producers and consumers show a significant

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[1] C.E. Ferguson and J.P. Gould, Microeconomic Theory, Fourth Edition, 1975, Richard D. Irwin, Inc.

response to change in prices.

The agricultural credit markets can be analysed in terms of the forces behind the demand and supply functions which operate in these markets. On the basis of the discussion in Chapter II, the demand for farm credit can be regarded as a derived demand for gross farm investment. This includes depreciation or replacement and new (net) investments. The demand for farm credit can, therefore, be referred to as an investment demand for capital. Much emphasis will therefore, be placed on the theory of investment demand for farm credit which will form a basis for model formulation in this study. A review of investment theories and their extensions follows.

Theories of Investment Demand

An investment decision is one which brings about an increase in the gross capital stock of a firm, industry or community.[2] A major assumption underlying investment demand theories is that the expected revenues accruing from an investment decision over the future life of the project will at least be equal to the total cost incurred over the entire life of the investment. In this regard, factors which affect the cost of investments and the expected revenues from the project have been incorporated in investment demand theories over the years.

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[2] D.C. Rowan and T. Mayer, Intermediate Microeconomics, Output, Inflation, and Growth, W.W. Norton & Company Inc., New York, 1972.

The Present Value Concept

The classical economists introduced the present value concept as a means of explaining investment behaviour. An investment decision is made if the present value of current and discounted future benefits or rewards projected over the life of the project exceed the costs of production over the entire life of the project. The present value of a project can be represented by the following equation:

$$PV = -C + \frac{R_t + 1}{1 + r} + \frac{R_t + 2}{(1+r)^2} \cdots \frac{R_t + n}{(1+r)^n} \qquad (1)$$

n = Economic life of the investment
C = Cost of the project
$R_t \cdots R_t + n$ = Revenues accruing to the investment from year t to year n
r = Interest rate (opportunity cost) on investment funds

Increases in the costs associated with running the project during its life period and in the opportunity cost of investment funds will reduce the total net discounted present value or profitability of the project and vice versa. We can, therefore, write a general functional equation based on the Present Value concept as:

$$I_t = f(r, C, U_y, N)$$

I_t = Present Total Investment

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[3] Paul Wonnacott, Macroeconomics, (Keynes' Marginal Efficiency of Investment: Stocks and Flows Once Again), pp. 368, Richard D. Irwin Inc., 1974.

N = Projected income associated with the investment
r = Interest Rate
U_y = Uncertainty attached to projected revenues

The Marginal Efficiency of Investment Criterion

Another method used in the evaluation of investment decisions was proposed by Keynes.[3] This method is the marginal efficiency of investment (MEI) which is defined as the interest rate that will discount the present value of a project to zero. A high MEI, therefore, indicates a project with a high present value of discounted expected returns. The concept can be represented by the following equation:

$$C = \frac{R_1}{(1+m)} + \frac{R_2}{(1+m)^2} + \ldots + \frac{R_n}{(1+m)^n} \qquad (2)$$

Where m is the marginal efficiency of investment

Investment propositions can be rated according to MEI criterion in any particular period. An MEI schedule can be constructed, showing the relationship between level of investments, the opportunity costs on capital (interest rates), and the marginal efficiency of investment. This MEI schedule reveals that for a higher amount of investment, the MEI is smaller and (given the costs), one moves towards additional projects with increasingly lower expected revenue streams.[4]

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[4] William H. Branson, Macroeconomic Theory and Policy, Harper AND Row, 1972.

The optimum level of investments is attained when the interest rate on investment funds equals the marginal efficiency of additional investment.

A point is made in this theory, however, that additional investment depends upon the previous level of capital stock. The investment decision is, therefore, one which seeks to optimize the level of capital stock in the production exercise. The MEI concept also takes into account the possibility of different costs of capital. Branson puts it this way:

> " it does have an advantage in that it points out the fact that there may be more than one cost of capital or interest rate facing a firm, depending upon the extent to which it draws on various sources of investment funds; and these various costs of capital level affects the firm's decision to invest. For example, firms tend to impute a lower interest rate to funds which are available from retained earnings. Higher interest rates are imputed to external sources of funding such as bond issues because they represent a fixed liability that must be paid on time regardless of the financial position of the firm, or stocks because they dilute the management's degree of control over the firm." 5

A modification of the MEI schedule can now be incorporated to take care of the effects of increase in investment funds. This refinement is well expressed by Rowan and Mayer.

> " so far, we have assumed that whatever the rate at which net investment is undertaken -- that is, whatever the rate at which the capital goods (in terms of the output they will generate) is constant. This assumption,

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5 William H. Branson, op. cit., pp. 204

FIGURE 3.1

INVESTMENT DEMAND SCHEDULE

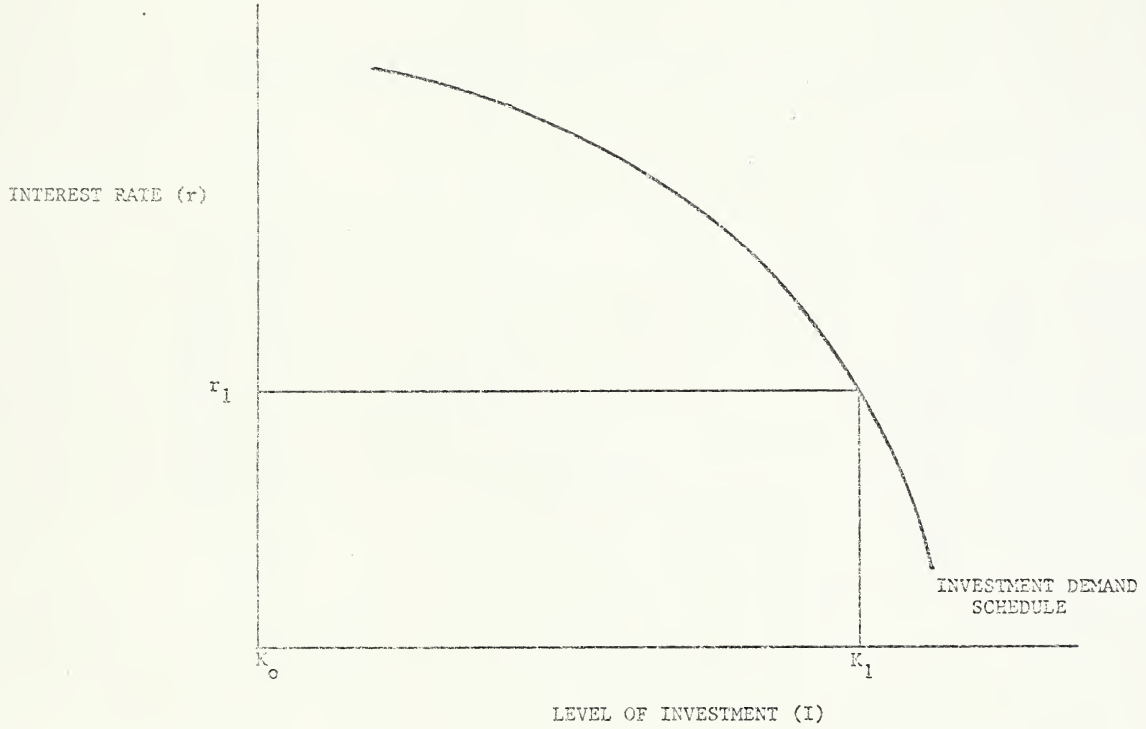


FIGURE 3.2

SUPPLY CURVE FOR INVESTMENT FUNDS

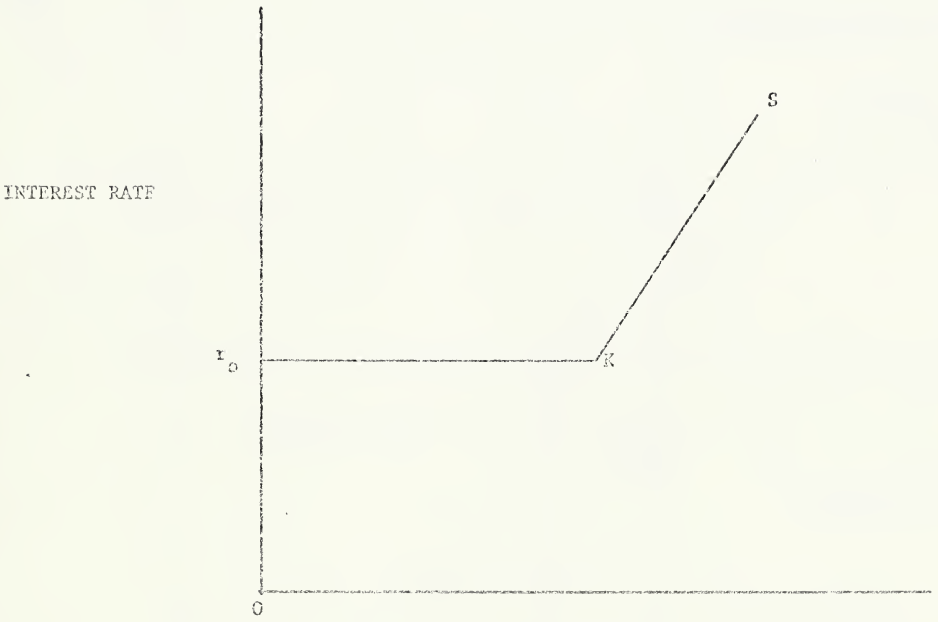
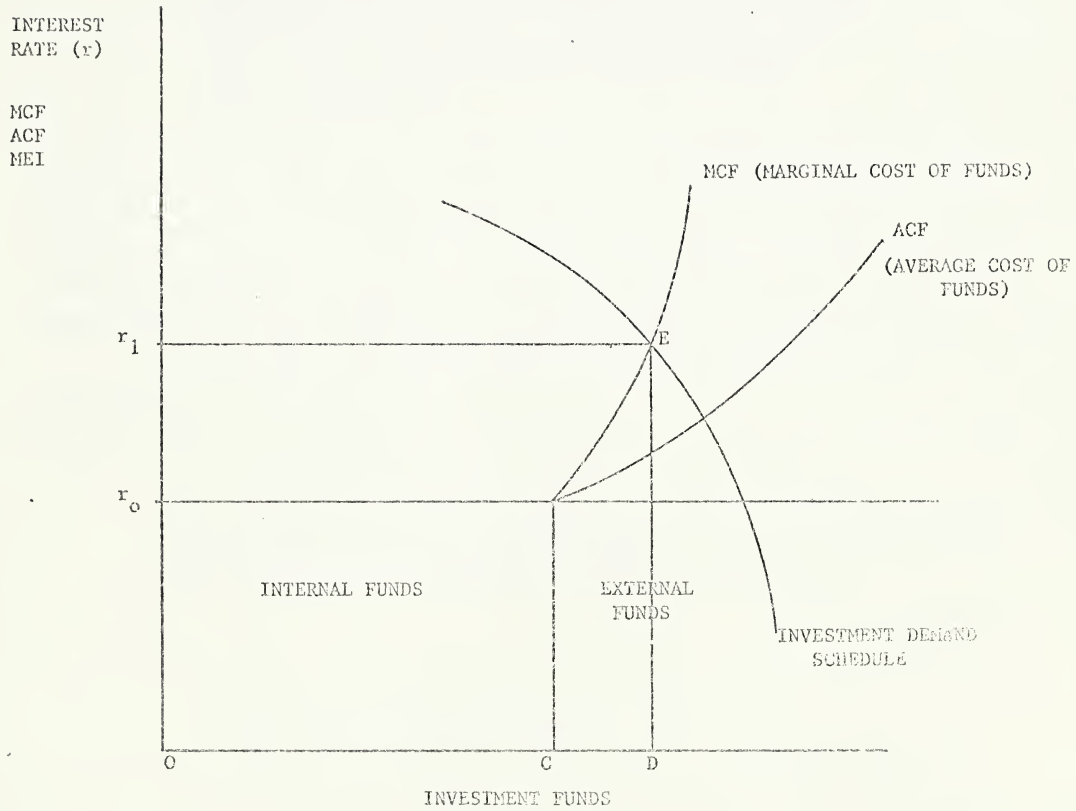


FIGURE 3.3

REAL NET INVESTMENT AND COST OF BORROWING



Adapted From Intermediate Macroeconomics, Output, Inflation and Growth by D.C. Rowan and T. Mayer, W.W. Norton & Co. Inc, N. York (pp. 158).

> though convenient, is unrealistic. As the rate of net investment increases, we will expect the supply price of capital goods (relative to the price of their output) to rise ... Hence the return per dollar on investment will tend to fall as the rate of investment increases for reasons which are external to the firm.
>
> If we now incorporate these modifications into our Marginal Efficiency of Investment Schedule and (recalling that profit maximization implies that businessmen will equate the MEI with r) plot r on the vertical axis and I_p on the horizontal, we obtain a curve we shall call the Investment Demand Schedule."[6]

The position of the Marginal Efficiency of Investment Schedule thus depends on the current level of capital relative to the optimum level Costs of profuction, the level of technology, cost of capital assets, expected revenues, the degree of uncertainty attached to the state of expectations, and the weighted opportunity cost of investment funds.

A functional equation based on the MEI concept can be written as $I_p = f(C,U_y,K,r,O)$.

U_y = Expected Income over the life of the project
C = Costs of Production including cost of capital equipment
K = Current level of Capital Stock
O = Productivity (Index of level of technology)

Fixed and Flexible Accelerator Theories of Investment Demand

The two theories discussed so far conceive of the demand for investment in a static framework. A modification to these theories

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[6] D.C. Rowan and Thomas Mayer, Intermediate Macroeconomic, Output, Inflation, and Growth, op. cit., pp. 153

described a state in which investment decisions are made solely to replace worn out parts and in addition to increase the level of capital stock from current to the optimum or desired level. Continuing net investments are, therefore, thought of as primarily caused by growth of output. This concept thus treats investment demand in a dynamic framework. This last observation relating the growth rate of output to the level of net investment required in called the fixed accelerator or stock-adjustment theory of investment.

The flexible accelerator model is further improvement on the fixed accelerator model. This model takes into account that different levels of net investments can be associated with the same rate of growth in output if the additional costs of production and the additional costs of investment funds increase. Also in the real world, desired levels of real investments are influenced by technological innovations and prospects of an increase in demand reflected in the growth in gross expenditures.

An assumption underlying the flexible accelerator model is that firms do not immediately effect a complete adjustment in their capital stock to changes in economic activity because they may view such changes as partially transitory in nature. In addition, there is always a delay encountered in ordering and installing new capital equipment (especially during periods of shortage of production materials). Added to this, the lack of availability of investment funds may force the firm to spread needed investments over several years.[7] An equation showing the

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[7] D. C. Rowan and Thomas Mayer, op. cit.

lag in adjustment of capital stock from the current level to the optimum level can be developed in this fashion:

$$I_n = b(K_t^* - K_{t-1})$$

I_n = Net Investment Planned
b = Coefficient of adjustment
$^*K_t$ = Desired level of Capital Stock (Current)
$K_t - 1$ = Optimal level of Capital in previous year

But $K_t = aY_t$ and $K_t - 1 = aY_{t-1}$

$a = (K/Y) \cdot (dK/dY)$
$^*Y_t$ = Level of Output desired in year t
Y_{t-1} = Level of Output in previous year

Therefore, $^*I_n = b(aY_t - aY_{t-1})$ by substitution
$I_n = V(^*Y_t - Y_{t-1})$

Where V is the accelerator coefficient of adjustment = ab

The accelerator model, however, loses its significance when substantial excess capital capacity exists since there is need for new investments and will be reduced regardless of changes in the growth of output and demand. Branson has cautioned, however, that "much of what appears to be excess capacity at any one time may actually be obsolete plant which embodies old uneconomic technology."[8] In such a situation

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[8] William H. Branson, Macroeconomic Theory and Policy, pp.214 op. cit.

net investment becomes part of replacement investment.

Liquidity and User Cost Effects and the Theory of Investment

The accelerator theories of investment demand treat the supply of funds as non-limiting, focus on the need for capital investments as determined by changes in expected revenues and level of capital stock in relation to expected changes in demand. In the liquidity theory of investment, decisions to undertake new investments depend not only on these factors but also on the cost and availability of investment funds.[9]

There are two sources of financing investment needs. These are internal (equity) and external funds. Internal funding can be generated from depreciation, net income and dividends from other investments. Net incomes depend upon the cash flow position of the firm and thus all factors which affect the net income e.g. the tax rate, consumption levels, costs of production affect the potential for internal funding. External financing of investment is the alternative to equity financing. Regardless of the interest rates charged on funds (which is a proxy for the potential returns to lenders), funds are rationed on the basis of type and perceived riskiness of the project proposed, debt repayment ability, net worth of the borrower, reserve ratio of banks, psychological state of the business environment (business cycle effects), current monetary and fiscal policies and types of capital sought -- short, medium or long term.

Figure 3.2 is a hypothetical supply schedule for investment

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[9] D.C. Rowan and Thomas Mayer, Intermediate Macroeconomics, Output, Inflation, and Growth, op. cit., pp. 173

funds, r_oKS. Segment r_oK represents internal funds, and KS represents the supply curve for external funds. As in the case of the Marginal Efficiency of Investment, the market for supply of investment is imperfect and, therefore, risks, uncertainties and diseconomies associated with lending represent additional costs of capital. The MCF (Marginal Cost for Funds) schedule takes account of the risks involved in financing increasing amounts of capital investment because of the increase in the debt equity ratio. (See Figure 4). Under these conditions, the rate of real planned investment is determined by equating the marginal efficiency of investment to the cost of borrowing.[10]

There are some other aspects of the user cost of capital which deserve attention and upon which the liquidity effects on investment demand is based. " The real user cost of capital depends upon the nominal value of the imputed rental value of capital services used in each period.[11] The user cost capital is, therefore, made up of three components These are the interest rate, depreciation costs and capital gains or losses that might accrue to owners of the capital resource over its entire life. Capital gains and losses on an investment is determined by the rate of inflation and also it depends upon the expected yield and wealth (direct and indirect) effects that accrue from different types of investments. The nominal user cost of capital can be written as:

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[10] D.C. Rowan and Thomas Mayer, op. cit.

[11] William H. Branson, op. cit.

$C = (rP_i - hP_i - dP_i/dt)$ therefore

$C = g(P_i, r, h, t)$

dP_i/dt = Rate of Inflation
h = Rate of Depreciation
t = Time
r = Cost of Capital (Interest Rate)
P_i = Price level

Usually, investment funds are drawn from several sources. "In a perfectly competitive market with no tax biases, the imputed costs assigned to each of these means of raising money would be the same allowing for risk differential."[12] To take care of these diffcrences, therefore, the market rate is a measure of all the different rates charged on funds borrowed. This representative interest rate is the weighted interest rate, and is defined as:

$$r_w = r_1(F_1/T) + r_2(F_2/T) + r_3(F_3/T) \ldots + r_n(F_n/T) \qquad (3)$$

r_w = Weighted Interest Rate
$r_1 r_2 r_3 r_n$ are interest rates charged on funds (internal & external) 1,2,3. . .n
$F_1 F_2 F_3 \ldots F_n$ = Funds borrowed from lenders 1,2,3. . .n
T = Total amount of Investment Funds borrowed from all lenders.

A principal assumption underlying the user cost theory is that changes in interest rates do cause changes in investment to a significant degree. But as Mayer and Rowan indicate, "it is conceivable that a

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[12] William H. Branson, op. cit., pp. 216

very large change in interest rates would change investment by only a trivial amount; that the interest rate is not a significant variable affecting investment." [13] The controversy surrounding the importance of investment response to interest rate changes is far from being resolved.*

The liquidity effect on investment demand basically has to do with the level of retained earnings available for investment purposes. The liquidity effect is, therefore, a restatement of the residual funds hypotheses of investment.[14,15] In the residual funds hypothesis, demand for investment funds are conceived of as that part of demand which results from the inability of firms to meet investment needs from equity sources. Therefore, changes in net income affect the demand for investment funds --- as net incomes increase, the demand for investment funds from external sources decrease and vice versa.

Another refinement of the liquidity theory is the effect of transitory incomes (windfall gains). This concept is discussed by Waugh.[16] Transitory income could be an important variable affecting investment decisions. Unexpected gains especially in periods of tight money and

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[13] D.C. Rowan and Thomas Mayer, op. cit.

[14] D.J. Waugh, "The Determinants of Investment in Australian Agriculture --- A Survey of Issues" Quarterly Review of Agricultural Economics, Bureau of Agricultural Economics, Australia, Vol. XXX, No.2, April, 1977.

[15] J.R. Brake, op. cit.

[16] D.J. Waugh, op. cit., pp. 134

*For a full account of this controversy, see Rowan and Mayer, op. cit, pp. 174-175.

high interest rates and for a firm whose credit reserve is low, could influence investment decisions to a significant extent.

The Profit Theory of Investment

According to this theory, investment decisions are made based upon projections made about the net profit in each year over the life time of the project.[17] Since this theory is based upon expectations it does not allow for empirical analysis. It is, therefore, not useful for our purposes.

An Integration of Investment Theories

Waugh has categorized Investment Demand theories into three groups:

> "(a) Desired Investment is determined by expected level of output, change in output or capacity utilization.
>
> (b) Desired capital determined by internal finance variables (residual funds of hypothesis).
>
> (c) Desired Capital determined by External Finance Variables e.g. interest rate. Alternative theories also differ in their treatment of the time structure of the investment response and their treatment of replacement investment." 18

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[17] Rowan and Mayer, op. cit., pp. 175

[18] D.J. Waugh, op. cit., pp. 149

A generalized functional equation can be written to embrace all three broad groups to include the relevant candidate variables and replacement investment. The gross investment can be expressed as:

$$I_g = {}^*I_n + I_r \quad (4)$$

where I_g = Gross investment

$^*I_n$ = Real planned net investment

I_r = Replacement investment

Replacement investment is dependent upon the rate of depreciation, hK.

Therefore, $I_g = f(K_{t-1}, Y_{t-1}, U_y, D/A, NI, TI, V, hK, P, P_1, r_w)$

K_{t-1} = Level of capital stock in previous year.

Y_{t-1} = Level of output in previous year.

U_y = Degree of uncertainty associated with projected income.

D/A = Debt Asset Ratio (A proxy for debt reserves).

NI = Net Income

TI = Transitory Income.

V = Accelerator adjustment coefficient

hK = Depreciation rate

P = Price levels in the economy (a proxy for costs of production)

P_1 = Rate of Inflation

r_w = Weighted interest rate

The equation can be rewritten as:

$$I_g = f(K_{t-1}, Y_{t-1}, U_y, D/A, TNI, V, hK, CP, P_1, r_w)$$

TNI = Total Net Income = NI + TI

CP = Cost of Production including cost of capital equipment, taxes, consumption etc.

Such a combination of the three theories has been considered by Waugh, who sees "the possibility of the relative importance of all three determinants of investment (output, internal and external funds), as dependent upon the time period considered." [19] He goes on to explain further that such an integrated model appears to provide an explanation of investment model based on the bifurcation hypothesis*, and also indicating that structural changes, contractionary and expansionary effects of business cycles deserve consideration in the development of the investment demand function. These business cycle effects and the other factors which are external to the firm can be represented by a leading business cycle indicator such as the gross national expenditure (GNE). A reformulated functional equation can be presented upon this basis as:

$$I_g = f(K_{t-1}, Y_{t-1}, U_y, D/A, TNI^*, V, hK, CP, r_w, GNE)$$

The inflation variable P_1 has been omitted. Capital gains are considered as partly transitory income accrued as a result of inflation and thus has been added to the total net income variable. This conclusion to quote Anderson as reported in Waugh's work is:

> ". . . a restatement of the neoclassical position that investment is determined by the intersection of the MEI with the MCF schedule. The MEI Schedule, Duesenberry argues, shifts about primarily in response to changes in the rate of utilization

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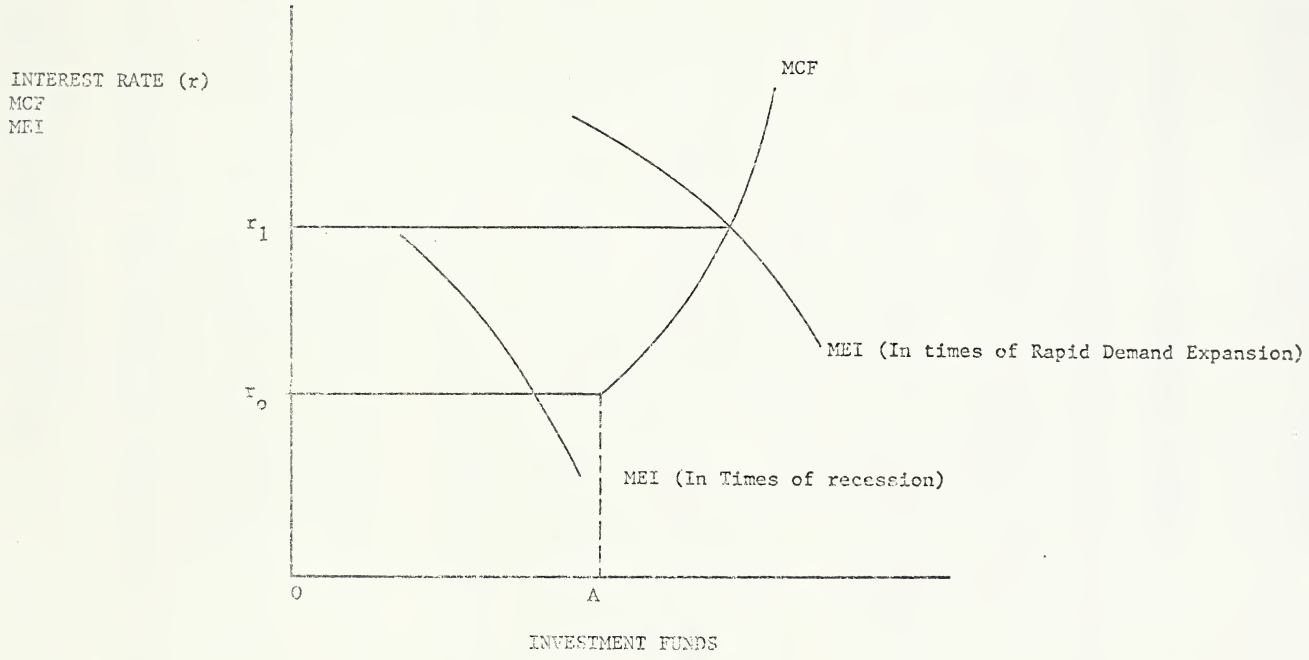
[19] D.J. Waugh, op. cit., pp. 137

* See Figure 3.4

FIGURE 3.4

THE BIFURCATION HYPOTHESIS
(GRAPHICAL ILLUSTRATION)



> of existing capacity. The MCF schedule shifts about in the degree of financial risk as well as to changes in the market cost of funds . . ." 20

Literature Review of Relevant Studies

The previous section dealt with a review of the concepts of supply and demand. The demand for credit was viewed as a derived demand for farm investment. This was followed by a review of investment theories, the implication being that the determinants of investment demand will serve as appropriate candidate variables for use in the investigation of the demand for farm credit.

In this section, a short review of previous studies on the demand for farm credit in Canada and studies on the demand for investment are present. An attempt is made to draw a link between the demand for farm credit and demand for farm investments. The last section contains an approach to the investigation of the determinants of the investment demand for farm credit which incorporates theories of demand for investment funds.

Several studies make mention of the growing use of external funds for farm financing, relating this increasing use to the rise in farm investments.[21] On the Canadian scene, the work of Dr. John Brake is representative of the methodology and basic assumption made by most researchers in this area. The review will, therefore, be based on

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[20] D.J. Waugh, op. cit., pp. 144

[21] A.G. Nelson, William G. Murray, and W.F. Lee, Agricultural Finance, Iowa State University Press, Ames, Iowa, USA, Chapter I.

Dr. Brake's study. This study was primarily concerned with the development of a model that would assist in the analysis and projection of credit needs in the farm sector. The demand for farm credit was conceived of as a residual function for investment capital. Brake puts it this way:

> "The major sources of capital for agriculture are equity capital which comes mainly from farm or non-farm income and debt capital which is borrowed by credit agencies. The total demand for agricultural purposes is supplied first from equity sources and second, from debt sources. In this context, then, the demand or (need) for credit represents a residual demand for capital. If one were able to estimate the quantity of capital which could be supplied from equity sources, he could then estimate capital needed from debt or credit sources." 22

The model used in the study was a cash-flow model. In this system, cash inflows and outflows for an accounting period are estimated and the net cash outflow or inflow is derived from these estimates. This becomes the basis for projecting potential equity and debt financing by the agricultural sector. Brake reminded the reader, however, that neither appreciation nor depreciation costs are included in the cash flow model (CFM) because they do not represent actual cash inflows or outflows but paper gain. He summarizes this position thus: "In short, the CFM does not account for all changes in capital stocks from one time period to another." 23

Another conceptual problem concerned the rate of emigration from the farm sector which involves a changing population in the accounting year to which the data applies. "Who are the relevant people --

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[22] J.R. Brake, op. cit.

[23] Ibid.

those who began the year as operators, those who ended as operators, or a mixture? Clearly, the model includes a mixture."[24] The primary concern is with the individual who leaves the farm sector or sells part of his land to a farm operator since that represents a cash inflow to farm operators.

The third difficulty he discussed relates to the use of a functional appraoch to credit projections and analysis based upon functional relationships affecting cash flows. While recognising this methodology, he has advanced reasons for not considering it and for using in its stead, a cash flow, credit analysis and projection model based upon different assumptions about relevant components of the model.

> " There are also some conceptual difficulties related to the construction of functional relationships affecting cash flows. One approach for making projections would be to specify a system of equations relating cash flows to endogenous and exogenous variables. For example, real estate purchases in any year could be considered a function of farm land prices, interest rates, ease of acquiring credit, technological change as it affects reorganization of farm units, number of retiring farmers, etc. For purposes of this study, no such elaborate system is constructed due to time and data limitations. Instead, past data and judgement are used as a basis for assumptions concerning relevant variables." 25

Assumptions about the rate of increases in population, Gross National Product, Farm Cash Receipts, Operating Expenses, number of farms, Farm Machinery and Capital Investment, Farm Livestock Inventory Value, Farm Land and Building Value, were made based on

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[24] J.R. Brake, op. cit.

[25] Ibid.

1961-1966 rates of change. Sensitivity analysis were made depending upon these assumptions to make alternate credit projections for 1980.

Implied in the methodology of this work is the concept of a demand for credit model conceived of as a derived demand for capital investment. The methodology is based mainly upon the residual funds theory of investment as described by Waugh.[26]

While the concept of a residual demand for credit might hold under certain assumptions, the approach could be challenged in the event that there are large cash withdrawals from fairly profitable farm ventures which are diverted to other uses outside the farm. Such an occurrence is conceivable if the present value of the discounted projected revenues over time of the alternative investment were higher than that which would accrue to the farm business and especially so if the cost of capital in the agrigultural credit markets are lower than other market rates. In such a situation, the demand for credit cannot be considered a residual for the farm business, specifically. The emergence of the Corporate Farm, increasing vertical integration, changing business management strategy by more qualified farm operators, makes the possibility of such a diversion real.

Another consideration involved depreciation costs. This variable is not included in the cash flow model due to reasons discussed above. Depreciation, however, plays an important role in all investment demand and related analysis. The exclusion of this important variable thus detracts on the ability of the model as an analytic as well as a

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[26] D.J. Waugh, op. cit.

predictive tool. Depreciation costs are included in the current work as one of the important variables determining capital investment in machinery. The inclusion of this variable becomes relevant when one is reminded of the fact that the demand for farm credit is a derived demand for additional gross farm investment needs which are not met from equity sources.

The second problem has to do with changes in the effect on the cash flow situation of farmers in the event of a loss to the aarm community resulting from the sale of assets to non-farm operators and the accounting difficultues presented. The problem is circumvented by the use of a behavioural model which does not depend upon accounting procedures but on the functional relationships of variables both exogenous and endogenous to the farm setting. This is discussed below in the context of the model for this study.

Brake agrees that a behavioural functional relationship between CFM variables is a useful framework in which analysis and projections of farm credit needs could be assessed. This is the primary purpose of the study. An attempt is made to build an initial functional model which could be used for analysis and prediction of the demand for long, intermediate and short term credit. It would conceive of the demand for credit as a derived demand for investment capital. An investment model which integrates the various investment theories is described by Waugh.[27] The demand for farm credit is thus represented as depending upon

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[27] D.J. Waugh, "The Determinants and Time Pattern of Investment Expenditures in the Australian Sheep Indistry", Quarterly Review of Agricultural Economics, Bureau of Agricultural Economics, Australia, Vol. XXX, No.2, April, 1977.

a desired level of investment, incorporating the main determinants of these theories. Waugh categorizes them into:

> "(a) The accelerator or stock adjustment variables.
> (b) Residual funds model variable.
> (c) Flexible rate of adjustment and internal liquidity variables.
> (d) External liquidity variables.
> (e) Real output and capital price variables.
> (f) Transitory income variables (which depend mainly upon the effect of improved price situation for products). This is the qualified residual funds hypothesis whereby increases in income associated with changes in transitory income provide resources to undertake investment plans." 28

As has already been indicated , projections for credit demand were made in Brake's study based on assumptions about the rate of change of different variables in relation to the rate of growth at a particular period in time -- 1961-1966. This method does not take into account either structural or trend changes both before and after the period. An attempt has been made to correct this deficiency, at least for the future years, by assuming that different rates of change exist for the various variables which affect the demand for credit. In summary, Brake's approach, therefore, does not do justice to behavioural considerations which affect demand for credit by farmers under changing socio-economic conditions. Owing to the defects, another important characteristic was overlooked. This is the response of farmers to the changing economic conditions as reflected in changes in their investment demand. These conditions could be short or long term and it would be a worthwhile effort to study the response of farmers and changes in farmer behaviour as a result of these changing factors. In the present method proposed, income,

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28 D.J. Waugh, "The Determinants and Time Pattern of Investment Expenditures in the Australian Sheep Industry", op. cit.

wealth, interest effects as well as lag structures due to institutional and technological and other constraints on the demand for farm credit could then be accounted for. If such information were available, it might aid borrowers, lenders and other interested parties in providing better services in the formulation of new, and the modification of present credit policies and legislations for the agricultural credit market by examining response trends of farmers to different variables over the years. This consideration becomes important because many authors concede that financing with new debt will grow in importance in the coming years.

CHAPTER IV

MODEL DEVELOPMENT, SOURCES AND MODIFICATION TO DATA

Introduction

In the previous Chapters, an attempt was made to present the problem, describe trends in the agricultural credit markets for short, intermediate and long term credits. Chapter III dealt with the theoretical background and review of the work related to the topic of the study. In this Chapter, a model is developed based upon the theoretical background, discussed and modified to suit the topic under study. The sources of data and modifications made on the original data are also discussed.

Model Development

The previous Chapter stressed the importance and usefulness of an approach to estimating the demand for credit based on functional relationships among variables of the cash flow model. The general model used in the study is an integrated investment demand function employing all the ideas incorporated in the different theories summarized by Waugh.[1] The various theories have been discussed in Chapter III.

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[1] D.J. Waugh, "The Determinants of Investment in Australian Agriculture -- A Survey of Issues", op. cit.

In addition to the cash flow variables, and in agreement with Brake, Waugh and other researchers, exogenous variables such as the gross national expenditure and interest rates were included to serve as a monitor on external influences like monetary and fiscal policies, effect of business cycles in the demand for agricultural products, and their effect on farm investment. A functional relationship based on the integrated investment demand theory was developed. The function can be stated as:

$$I_g = I_n + I_r = f(P_1, K_t, Y_t, hK, r, P, TNI^*_{t-1}, GNE, Inv)$$

Since the demand for farm credit is assumed to be a derived demnd for agricultural investments credit can serve as a proxy for farm investment needs which are met from external sources, depending on the financial position of the farm operator. The functional relationship can, therefore, be restated as:

$$D = f(K_{t-1}, Y_{t-1}, r_w, hK, P, TNI^*_{t-1}, GNE, Inv, P_1, U_y)$$

D	=	Quantity of Credit demanded.
K_{t-1}	=	Level of capital accumulation in time period t-1.
Y_{t-1}	=	Output level at the end of time period t-1.
r_w	=	Interest rates on credit (weighted).
hK	=	Depreciation costs.
p	=	Price Index of inputs (proxy for the cost of production).
TNI^*_{t-1}	=	Total net farm income including farm and non-farm revenues.
GNE	=	Gross National Expenditure.

P_1 = Rate of inflation.

U_y = Certainty equivalent of expected future revenues.

Inv = Changes in inventory accumulation (an important variable in the cash flow model).

The assumption underlying this model is that consumption credit forms an insignificant portion of the total amount of credit extended to farmers. In this context, demand for farm credit is solely utilized for farm investment purposes. Also, the investment theories discussed so far relate to incorporated businesses with returns on investments conceived as extending through infinity. Farm businesses are traditionally unincorporated, family owned operations and they do change hands after a period of time through sale and other means of transfer. In this context, the theories discussed here may not apply to farm operations. However, the average turnover period for a Canadian Farm as reported by Brake is in the neighbourhood of 40 years, (See J.R. Brake, "Future Capital and Credit Needs of Canadian Agriculture". Department of Agricultural Economics, University of Guelph Publication No. AE.70/3) which is a long enough period. In this relationship the farm operator's investment decision may be regarded as not different from that made by the management of an incorporated business in terms of time preferences. In addition, there is a trend towards incorporation of the farm businesses, a phenomenon which has become quite important in the transformation of Canadian Agriculture. The implication is that the theories discussed should become increasingly applicable to farm business operations.

Different functions will be developed for the various kinds of credit i.e. short, intermediate and long term farm credit, respectively.

This was necessary because of the varying end uses and terms of lending for credit available. Another reason for developing alternative functions was that the factors which govern supply of credit are not the same in the different markets. The respective functional equations are presented below.

Short Term Credit Function

$$YDS = f(IS, FI, FF, Inv, TVA, OUT, GNE)$$

Intermediate Term Credit Function

$$YDI = f(II, FI, MS, DPN, TVA, OUT, GNE)$$

Long Term Credit Function

$$YDL = f(IL, FI, LB, TVA, OUT, GNE)$$

IS, II, IL	=	Interest rates for the short, intermediate and long term functions.
FI	=	Net farm incomes (from all sources).
Inv	=	Inventory Accumulation.
TVA	=	Total value of farm assets.
OUT	=	Physical output index.
FF, MS, LB	=	Price index for operating supplies, machinery and farm implements, land and building, respectively.
DPN	=	Depreciation costs.

The basic functional relationships will be studied with the help of econometric models.

The Econometric Approach

McIntosh describes this technique adequately.

> "The method of econometric analysis combines diagnosis with prediction. In econometric analysis, dependency relationships are specified between a dependent variable whose value is to be predicted and one or more

> independent or explanatory variables. When expected values of the independent variables are substituted in the models, the expected values of the dependent variables are ascertained." 2

Single equation multiple regression functions will be used in the study. Factors affecting the demand for farm credit are investigated based upon this regression format. In addition, predictions about the demand for credit may be made based on the results of the models.

The method of this study will, therefore, involve an investigation and prediction of the demand for farm credit through a study of the cash flow variables on a time series basis. In addition, the effects of other economic factors (such as the interest rate, and gross national expenditure) which may have an influence, not only on the results of the cash flow in each future year but also in the implementation of plans in that year, will be investigated using the models developed in the study.

The multiple regressing format can be represented thus:

$$Y = a + b_i X_i + U$$

Y = Dependent variable

X_i = Independent variables

U = An error term which accounts for unexplained variations.

Different model specifications are used in the analysis for each type of credit. These are the Linear (raw data) and Double logarithmic formulations

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[2] C.E. McIntosh, "Demand for Meat and Dairy Products in Canada with Projections for 1980", Unpublished Ph.D. Thesis, Department of Rural Economy, University of Alberta, (1972).

of the multiple regression model.

$$\hat{Y} = a + b_i X_i + \hat{U} \quad \text{. . . (Linear)}$$

$$\text{Log } \hat{Y} = a + b_i \log X_i + \hat{U} \quad \text{. . . (Double Logarithmic)}$$

Because of the constraints that exist on the long term credit market due to several factors such as the lending policies of credit agencies, it is hypothesized that the demand for long term farm credit in any particular year depends upon a partial adjustment factor. This factor is, therefore, incorporated into a short run (year-to-year) long term credit model.

Let $Y^* = r_o + r_i X_i + U$ = the desired demand for farm credit.

and $Y_t - Y_{t-1} = \lambda (Y^*_t - Y_{t-1})$ where λ is an adjustment factor based upon Koyck's partial adjustment investment model.*

Therefore, $Y_t = \lambda Y^*_t - \lambda Y_{t-1} + Y_{t-1}$

$Y_t = \lambda Y^*_t + (1-X) Y_{t-1}$, and substituting from above,

$Y_t = \lambda r_o + \lambda r_i X_i (1-\lambda) Y_{t-1} + \lambda U$ 3

$0 \leq \lambda \leq 1$

The short run demand for long term farm credit can, therefore, be represented by this functional relationship

$$YDL = f(IL, FI, LB, TVA, \lambda, GNE)$$

where λ is the coefficient of adjustment due to the effects of limitations

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*Several authors have used the partial adjustment model. For example see Zvi Grilliches. "The Demand for Fertilizer: An Economic Interpretation of a Technical Change". Journal of Farm Economics, Vol. 40, Part 1, (1958)

3. M. Dutta, "Econometric Methods", South Western Publishing Co. Cincinnati, Ohio, 1975, pp. 191-194.

on the demand for long term credit. Response of farmers to the independent variables (elasticities) are estimated from these models.

Sources and Modification of Data

Sources of Data

The use of time series analysis necessitated the employment of secondary data. All data used are annual data for Canada as a whole. They cover the period from 1950 to 1975.

Data on the index of physical output of agricultural produce was obtained from Selected Agricultural Statistics for Canada published by the Canada Department of Agriculture. Statistics Canada publications provided information on Changes in Inventory Accumulation, Depreciation costs, Total Costs of production, Gross and Net Farm Incomes, Price indexes of machinery, and production supplies. Data on Price Index on Land (real estate) were taken from a publication by the Farm Credit Corporation's Farm Credit and Related Statistics. The yearly articles on Farm Credit by Dr. Rust in the Canadian Farm Economics journal provided statistics on the estimated amount of credit extended and outstanding from 1960 to 1975. These include short, intermediate and long term credit. Data on credit extended from 1950 to 1959 were not available and they had to be estimated. However data on credit outstanding were obtained from a publication by the Agricultural Economics

TABLE 4.1

TOTAL CREDIT EXTENDED ($ Millions)

YEAR	TOTAL YDG	SHORT YDS	INTERMEDIATE YDL	LONG YDL
1949	483.6	290.1	101.2	64.20
1950	499.4	329.6	102.4	66.10
	529.4	349.4	108.5	70.00
	560.0	370.1	115.0	74.10
	587.2	387.6	120.3	77.60
	658.8	434.8	135.1	87.10
1955	692.7	446.4	138.7	89.40
	739.8	457.2	129.0	91.50
	798.1	488.3	151.7	97.80
	692.7	526.7	163.6	105.50
	901.2	596.6	189.4	119.10
1960	1030.4	668.0	219.7	122.70
	1149.6	779.5	231.9	138.20
	1288.5	878.5	206.3	149.70
	1460.9	979.2	306.8	173.10
	1641.7	1063.0	354.3	224.40
1965	1862.8	1135.0	435.7	296.20
	2021.7	1201.4	476.4	344.20
	2270.0	1388.4	5041.1	378.50
	2177.2	1548.5	312.5	316.80
	2168.9	1507.7	415.5	245.70
1970	2239.5	1622.5	420.2	196.80
	2460.7	1906.3	528.4	206.00
	2975.8	2042.6	701.3	231.90
	3712.0	2409.6	840.6	461.80
	4441.1	2887.9	917.4	635.80
1975	5413.4	3559.9	1199.1	654.40

SOURCE: Canadian Farm Economics, (Various issues)

TABLE 4.2

DEBT OUTSTANDING ON CREDIT EXTENDED ($ Millions)

	TOTAL	SHORT	INTERMEDIATE	LONG
YEAR	DOG	DOS	DOI	DOL
1949	986.0	290.8	306.5	188.7
1950	796.0	294.5	310.4	238.1
	843.0	311.9	328.8	252.3
	893.0	330.4	348.	266.3
	935.0	346.0	364.7	338.3
	1049.0	388.1	409.1	289.8
1955	1077.0	398.5	420.0	238.5
	1103.0	408.1	430.2	399.7
	1178.0	435.9	459.4	375.7
	1271.0	470.3	495.7	569.0
	1435.0	529.8	579.7	475.0
1960	1458.6	589.9	624.5	561.7
	1785.1	680.8	684.8	652.2
	2017.8	761.8	772.9	762.9
	2292.6	827.8	882.8	902.7
	2613.3	886.0	1028.6	1089.8
1965	3004.4	947.60	1169.1	1327.5
	3444.2	1089.8	1300.8	1560.1
	3950.7	1243.7	1147.7	1713.4
	4104.8	1417.7	1210.9	1796.2
	4424.8	1466.7	1177.7	1854.3
1970	4480.7	1588.9	1249.5	1875.9
	4714.3	1735.9	1431.7	1917.6
	5085.2	1921.8	1807.7	2132.4
	5861.9	2310.2	1967.7	2463.3
	6888.9	2631.6	2733.4	2755.9
1975	8118.9	3004.0	2841.6	3409.9

SOURCE: Canada Farm Economics, Various Issues

TABLE 4.3

WEIGHTED INTEREST RATES ON BORROWED FUNDS

YEAR	TOTAL I_G	SHORT I_S	INTERMEDIATE II	LONG IL
1949	3.60	4.50	3.00	1.45
1950	3.60	4.75	4.30	1.75
	3.90	5.05	4.60	2.05
	4.20	5.40	4.95	2.35
	4.50	5.65	5.25	2.65
	4.80	5.95	5.50	2.97
1955	5.10	6.25	5.80	3.25
	5.60	6.75	6.40	3.75
	5.90	7.00	6.60	4.00
	6.00	7.12	6.70	4.10
	6.10	7.25	6.80	4.30
1960	7.30	8.50	8.00	5.50
	7.20	8.30	7.80	5.30
	7.70	8.80	8.40	5.80
	8.00	9.20	8.60	6.20
	7.10	8.20	6.80	5.20
1965	7.80	8.40	7.40	5.40
	8.00	8.80	8.00	5.80
	9.50	8.20	8.80	6.20
	9.60	10.30	8.70	6.70
	10.10	10.80	9.40	7.30
1970	8.50	10.50	9.25	7.50
	8.90	9.50	8.50	7.60
	8.50	8.40	9.10	6.00
	10.30	11.10	10.00	6.70
	11.20	11.00	11.30	7.30
1975	10.90	11.40	11.10	7.80

SOURCE: Data were taken from Canadian Farm Economic (Various issues)

Research Council.[4] The data on debt outstanding were used to estimate the total credit extended from 1950 to 1959.

Various sources were consulted for data on the interest rates for each type of credit. Data on weighted interest rates on long term credit were taken from the articles by Rust publiched in various issues of the Canadian Farm Economics journal from 1960 to 1975. Farm Credit Corporation figures and those of the Canada Farm Loans Board were used as base figures from which long term interest rates were generated. Weighted interest charges on intermediate term credit from 1960 to 1975 were taken from various issues of Canadian Farm Economics, whiles the annual publications of the Farm Improvement Loans Act Report published by the Canada Department of Finance, provided the data on intermediate term credit from 1950 to 1960. Articles by Rust were consulted for data on the weighted interest charges on short term credit from 1960 to 1975. Data on interest charges for short term loans for 1950 to 1959 were obtained from the Bank Canada Review. The method of computing the weighted interest rate for the period 1950 to 1959 for the three types of credit will be discussed in the next section. Data on the Gross National Expenditure were taken from various issues of the Bank of Canada Review.

Modifications to the Data

Modifications to the original data used in the study were made on interest rate and credit extended. Estimates of total credit

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[4] M.L. Lerohl, "Assets, Liabilities and Net Worth of Canadian Farm Operators, 1935-64", Agricultural Economics Research Council of Canada Publication No. 10.

TABLE 4.4

FARM INVESTMENTS, CANADA: 1949-1975 (Index Figures)

	ALL INPUTS	PRODUCTION INPUTS	MACHINERY IMPLEMENTS	LAND & STRUCTURE REAL ESTATE
YEAR	FIPI	FF	MS	LB
1949	206.5	180.2	180.0	100.0
1950	218.6	194.3	185.0	110.0
	237.8	207.5	190.0	115.0
	245.3	212.5	194.0	120.0
	243.6	206.3	198.0	128.0
	240.0	201.9	118.0	125.0
1955	341.8	203.3	199.8	130.0
	254.3	210.7	209.7	138.0
	259.1	209.7	224.5	140.0
	263.9	213.7	237.2	145.0
	275.2	218.8	248.2	150.0
1960	279.6	222.0	255.5	155.0
	288.9	230.0	262.7	162.0
	295.7	236.0	270.5	168.0
	301.9	236.8	273.1	180.0
	311.4	244.2	279.7	200.0
1965	329.2	247.4	284.9	225.0
	349.0	256.6	293.9	250.0
	367.1	265.1	302.1	278.0
	398.0	273.1	314.5	300.0
	410.7	277.4	326.3	305.0
1970	429.7	294.5	352.0	288.0
	452.0	300.5	360.4	288.0
	478.8	311.5	365.9	295.0
	491.1	417.3	383.0	345.0
	572.0	514.8	427.4	455.0
1975	622.3	533.3	497.0	563.0

SOURCE: Statistics Canada Publications (various issues)

TABLE 4.5

TOTAL VALUE OF FARM ASSETS, INDEX OF PHYSICAL OUTPUT
FARM REVENUE AND GROSS NATIONAL EXPENDITURE

YEAR	TOTAL VALUE OF FARM ASSETS [b] TVA	INDEX OF PHYSICAL OUTPUT (AGRI) OUT	FARM REVENUE (NET) [b] FI	GROSS NATIONAL EXPENDITURES [a] GNE
1949	772.9	84.4	1604.10	43.10
1950	840.5	93.2	1451.71	47.8
	972.4	103.2	2221.22	52.8
	981.6	118.2	1949.90	56.3
	1019.8	109.9	1696.90	59.0
	1031.3	87.8	1454.27	63.10
1955	1053.9	107.3	1423.21	67.4
	1084.2	115.3	1457.20	68.8
	1174.2	99.2	1058.27	69.8
	1228.5	107.4	1337.60	71.2
	1230.8	107.9	1199.36	72.1
1960	1268.0	114.7	1195.85	72.4
	1315.9	100.0	921.85	73.4
	1368.1	127.7	1525.90	74.8
	1454.1	139.9	1521.20	76.6
	1579.0	129.5	1292.10	79.1
1965	1728.7	131.7	1566.80	82.6
	1916.60	155.1	1948.90	85.9
	2095.2	134.7	1496.08	88.7
	2270.0	145.3	1743.13	92.6
	2350.7	149.8	1688.37	96.9
1970	2380.1	137.9	1421.06	100.00
	2788.6	159.7	1680.23	105.00
	3517.8	147.4	1869.84	114.6
	2952.0	153.3	3287.88	131.7
	3608.1	148.4	3834.90	146.4
1975	4253.1	159.5	4545.58	146.6

SOURCE: Statistics Canada Publications,

[a] "Bank of Canada Review"

[b] $ Millions

TABLE 4.6

CHANGES IN INVENTORY, ACCUMULATION, DEPRECIATION, COSTS
RATE OF RETURN ON INVESTMENTS, AND DEBT, ASSETS, RATIO

YEAR	CHANGE IN INVENTORY ACCUMULATION [a] INV	DEPRECIATION COSTS [a] DPN	RATE OF RETURN ON INVESTMENTS [b] RRI	DEBT ASSET RATIO [c] DA
1949	-76155	137.50	2.07	1.02
1950	130729	153.70	1.73	0.95
	353493	196.30	2.28	0.87
	237265	212.40	1.99	0.91
	50263	232.80	1.66	0.92
	-115409	245.70	1.41	1.02
1955	210820	284.80	1.35	1.02
	169747	284.80	1.34	1.02
	-138690	285.40	0.90	1.00
	-64610	286.50	0.83	1.03
	-69504	291.80	0.97	1.16
1960	36111	368.27	0.94	1.22
	-307247	380.15	0.70	1.36
	117313	393.92	1.11	1.47
	306813	416.65	1.05	1.58
	4904	450.97	0.82	1.66
1965	44280	493.42	0.91	1.74
	205177	542.26	1.02	1.76
	-155115	602.21	0.71	1.71
	210312	658.10	0.67	1.81
	308866	691.74	0.72	1.88
1970	61995	604.34	0.59	1.88
	190384	603.14	0.70	1.97
	-260103	635.57	0.74	2.02
	515406	758.13	1.11	1.99
	-91307	891.99	1.06	1.91
1975	255382	1070.13	1.06	1.91

SOURCE: a, Statistics Canada Publications
b, Estimated from Gross Farm Expenditures, Total Value of Farm Asset figures
c, Established from Farm Debt, and Farm Asset Figures

extended for 1950 to 1959 were computed by finding ratios between short, intermediate and long term credit extended and the total debt outstanding for all types of credit from 1960 to 1975. Since these ratios were fairly constant for the years under study, they were employed in estimating the amount of short, long, and intermediate term credit extended from 1950 to 1959. Weighted interest rate figures from various articles on Farm Credit by Rust in the Canadian Farm Economics journal for short, intermediate and long term credit were compared to data from various other sources (as referred to in the previous section) depending upon the type of credit. Data from these sources from 1960 to 1975 were used in combination with those from the Canadian Farm Economics issues and a ratio between the two sets was evolved for each type of credit. On the basis of these ratios and the data from the various sources for 1950 to 1959, estimated weighted interest rates on short, intermediate and long term credit were calculated.

CHAPTER V

ANALYTIC RESULTS AND LIMITATIONS OF THE STUDY

Introduction

In this Chapter, estimates of the parameters of the equations presented in Chapter IV are calculated by the ordinary Lease Squares (OLS) method. The OLS method was applied to the two functional forms ie. linear (raw data and double logarithmic), for the three types of farm credit namely, short, intermediate and long term.

The analytic and predictive potentials of the various models are evaluated on the basis of the sign (direction of correlation) associated with the estimated parameters of the variables and their conformation with expectations based on the integrated investment model developed in Chapter IV. In addition, the level of significance of the estimated parameters of the independent variables in each model is determined based on the t-statistic values associated with the individual parameters. The model as a whole is also evaluated with respect to its usefulness on the basis of the amount of variation in the dependent variable which is explained by the R^2. The significance of each of the R^2 statistic values are also tested by using the F-statistic.

The extent and direction of autocorrelation in the various models is investigated by the use of the (Durbin Watson) D.W.-statistic for the short and intermediate term models. The h-statistic (a modified

form of the D.W.) is used to test for autocorrelation in the long term credit models since the dependent variable was included in the set of independent variables as a lag variable.

Results of the correlation matrix and t-statistics were investigated to ascertain the degree of multicollinearity among the independent variable.

The models to be analysed are categorized into full and reduced models. The full models are those in which all the variables discussed in the original models developed in Chapter IV are included. These full models attempt to test the validity of the integrated investment demand theory as a means of explaining the demand for farm credit. The essential feature of this approach is that it incorporates the acceleration, residual and bifurcation hypotheses. Because of the suspicion of a high degree of multicollinearity in the data, the reduction in the number of variables in the models was effected as a method by which a reduction in the level of multicollinearity might be achieved. Both types of equations, full and reduced, are analysed on the basis of the statistics discussed above over a time span of 26 years -- 1950 to 1975. Each model has been assigned a number in order to make reference to them in the discussion, orderly.

The response of borrowers with respect to their borrowing behaviour to changes in the candidate variables (elasticity estimates) are calculated for each type of credit. The implications of the results from the study are discussed.

In the final section, the limitations of the study are set out.

Results of the short Term Credit Demand Models

Models 1.11 and 1.13 are short term credit models in the linear (raw data), and double logarithmic formulations, respectively for the period of 1950 to 1975. Models 1.21 and 1.23 are the corresponding reduced models for the same period. Results of the short term models are presented in Table 5.1.

Results of the linear (raw data) model (1.11) indicates that capital accumulation (TVA), the price index of production inputs, interest rates on short term loans, the index of physical agricultural output are the most important determinants of the demand for short term credit. The double logarithmic model (1.13) presents net farm incomes and capital accumulation as the most important explanatory variables of changes in the demand for short term credit. The positive sign associated with estimated parameters of the interest rate is contrary to expectations under the theory of demand. This might be due to the exclusion of changes in inventory accumulation as an explanatory variable from the model (see also results of model 1.23). Results of the reduced models, 1.21 and 1.23 on the whole support the results of the full models.

GUIDE TO SELECTED MODELS

IS	=	Weighted Interest rate for short term loans.
FI	=	Net Farm Incomes.
TVA	=	Total Value of Farm Assets (Capital Accumulation).
FF	=	Price Index for Production Inputs e.g. Fertilizer and Feed.
Inv	=	Changes in Inventory Accumulation.
OUT	=	Index of Physical Output of Agricultural Produce.
GNE	=	Index of the Gross National Expenditure.
II	=	Weighted interest rate for intermediate term loans.
DPN	=	Depreciation Costs.
MS	=	Price Index for Intermediate Term inputs e.g. Machinery.
IL	=	Weighted Interest rates for long term real estate loans.
LB	=	Price Index for real estate.
YLD_{t-1}	=	Lagged value of the dependent variable YL.
SE	=	Standard Error of the Estimate.
F	=	F-Statistic.
DW	=	Durbin-Watson Statistic.
R^2	=	Coefficient of Determination.
CV	=	Coefficient of Variation.
a	=	Regression Parameters associated with the independent variables.
b	=	t-statistic values.
c	=	Elasticity estimates.
d	=	Parameter estimates equal to elasticity estimates for log functions.

TABLE 5.1
RESULTS OF THE SHORT TERM DEMAND MODELS

MODEL		K_o	IS	FL_{t-1}	TVA	PT	INV_{t-1}	OUT_{t-1}	GNE	SE	F	DW	R^2	CV
Raw Data	a	-850.8	-44.5	-0.10	0.72	2.30	-0.001	4.50	2.35					
1.11	b	-(3.20)	-(1.86)**	-(1.30)°	(4.37)***	(2.25)**	(1.60)°	(1.94)*	(0.45)	85.89	346.14	1.08	98.9	7.46
	c	---	0.31	0.16	1.08	0.55	0.015	0.48	0.16					
First Difference		37.9	-75.9	0.01	0.45	0.73	-0.0004	0.99	16.84					
1.12		(1.44)	-(2.81)**	(0.27)	(1.92)*	(0.78)	-(2.71)**	(0.57)	(1.60)°	72.09	15.19	2.29+++	80.5	55.8
Double Logs		-4.51	0.25	-(0.36)	1.30	0.54		0.46	-0.31					
1.13		-(5.45)	(0.94)	-(2.60)**	(4.26)***	(1.43)°		(1.63)°	-(0.72)	.103	194.0	1.27+	97.9	1.53
Raw Data		-456.8	33.07	0.15	0.94	1.75	-0.0003							
1.21		-(2.75)	-(1.37)°	-(2.08)**	(9.11)***	(1.96)*	-(0.26)			90.4	436.6	1.10+	98.8	7.9
First Difference		57.3	78.4	0.03	0.72	0.99	-0.0003							
1.22		(2.43)	-(2.94)***	(0.60)	(5.19)***	(1.10)°	(2.60)**			73.1	20.16	2.01+	94.1	56.6
Double Logs		-3.19	0.24	-(0.25)	1.49	0.12								
1.23		-(6.5)	(0.98)	-(1.98)**	(6.77)***	(0.36)				0.11	276.9	0.96++	97.7	1.55

a Parameter Estimates
b t statistic values
c Elasticity Estimates.
d Parameter estimates = Elasticity

*** Significance at 99% level
** Significance at 95% level
* Significance at 90% level
° Significance at 80% level

\+ Inconclusive Evidence for Autocorrelation
++ Positive Autocorrelation
+++ Negative Autocorrelation

The Raw Data models are selected as the representative models for analysing and predicting changes in short term credit on the basis of their model statistics and consistency of parameter signs on the interest rate variable.

The linear, full, and raw data model (1.11) is selected as the more attractive model compared to 1.21 to be used in the analysis and prediction of the demand for short term credit in the farm sector. The model and regression results based on it are presented below.

$$YDS = k_o + k_1 IS + k_2 FI + k_3 TVA + k_4 FF + k_5 INV + k_6 OUT + K_7 GNE + u_1$$

-950.8	- 44.5IS	- 0.10FI	+ 0.72TVA	+ 2.39FF	- 0.001INV	+ 4.45OUT	+ 2.35GNE
-(3.20)	-(1.86)	-(1.30)	(4.37)	(2.25)	(1.60)	(1.94)	(0.45)
***	-0.31	-0.16	1.08	0.55	-0.015	0.48	0.16

R^2 = 98.9 F = 346.14 S.E. = 85.89 D.W. = 1.08 C.V = 7.46

t values are in brackets
***Elasticity estimates

The most important explanatory variables based upon the results of model 1.11 are the value of farm assets, the price index of production inputs (proxy for inflation and cost of production), the wrighted average interest rates on short term loans and the index of physical output of agricultural products. These variables have a t-statistic value significant at the 99 percent level. The less

important variables are the changes in inventory accumulation and net farm incomes. These variables were significant at the 90 percent level. The GNE variable is significant at less than 50 percent level of significance, indicating the relatively low effect changes in the GNE has on the investment demand for short term credit.

The total value of assets (TVA), represents capital accumulation on the farm sector over the years. Also, the total value of farm wealth represents command over assets by farmers which could serve as collateral in support of their demand for credit. The potential for use of farm assets as collateral in support of the demand for credit is high because of the low debt asset ratio position enjoyed by the farm sector as a whole. In addition, the increase in capital accumulation over the years is a good indicator of the growth in the size of the farming industry. In this context, therefore, an increase in the amount of production inputs purchased will rise to complement the expansion in the capital base in the production process in order that efficiency in production might be maintained. The estimated wealth elasticity coefficient of 1.08 for short term demand for production credit supports the discussion presented above.

The price index of production inputs (FF) is the next most important explanatory variable in Model 1.11. The variable is a proxy for costs of production and inflationary effects on the demand for short term credit for the purchase of production inputs. The rapid increases in the prices of production inputs caused by the general rise in price levels in the economy and the occurrence of shortages in some periods might have an effect on the demand for short term credit. In addition, most production inputs are purchased and paid for by the end of the

production season. Being variable costs, they represent a major proportion of the costs of production. Changes in price of these inputs in a period which has been characterised by price and income instability and decline for the farm sector as a whole, may be factors which affect the decision of borrowers to a very significant extent. The relatively high elasticity estimate for this variable (0.55), lends support to the above observations.

The weighted interest rate on short term credit (IS) was also significant at the 99 percent level. This result is contrary to expectation since interest charges on short term loans constitutes a small part of the total costs of production. The high interest rates on short term credit (relative to the other types of credit)paid by borrowers might make changes in the interest rates on short term credits. The elasticity estimate of 0.31, however, does not support the highly significant t-value of 1.86. The relative inelasticity of interest demand for short term credit might be due to the lack of a large number of alternative sources of short term credit as well as the possibility that other variables are more important as determinants of the demand for short term credit than the interest rate.

The index of physical output of agricultural products came out as a significant explanatory variable in the model. The variable represents to some extent, the growth of technological innovation in the farm sector. Associated with the development of techniques of production in the farm sector are expansion of farm sizes, increased capitalization, rising costs of production and an increasing need for off-farm financing.

of farm investment. Technological innovations as represented by the index of physical output could, therefore, be an influence (directly or indirectly) on the decision to borrow short term credit since the potential for increased production ensures that at least, variable costs can be covered in the short run.

Net farm incomes and changes in inventory accumulation are not as significant as the other variables discussed already.

The relatively low level of significance associated with the net farm income variable was unexpected. One would expect that net farm incomes would play an important part in the ability to purchase variable inputs at the start of each production year and should be a more significant determinant of the demand for short term credit. The negative sign associated with the net farm income parameter, however, seems to support the residual funds hypothesis of investment demand.

Annual changes in inventory accumulation (INV) represents the surplus or unsold amount of farm products after the production period. The level of surplus produce in each year is a reflection of business cycle effects on the farming industry. A smaller amount of short term credit would, therefore, be on demand during slack periods. When the amount of surplus production is high, farm incomes are reduced and vice versa.

On the basis of the statistical results presented in Model 1.11, the Gross National Expenditure (GNE) is a relatively unimportant factor affecting the demand for short term credit in the farm sector. The elasticity estimate of 0.16 for the Gross National Expenditure seems to support the model on the whole. Despite the low level of significance of the GNE variable, the statistical results based on the model seems to suggest, on

the whole that an integrated investment model might be more appropriate for analysing and predicting changes in the investment demand for short term farm credit because of the importance of the interest rate variables. (The implication of this observation is that a model based on or which includes factors which can monitor bifurcation effects on the demand for short term credit would not be as useful).

Results of the Intermediate Term Credit Models

Models 2.11 and 2.13 are the full intermediate term models to which annual data covering 1950-1975 were fitted. Models 2.21 and 2.23 are the reduced models for the linear (raw data), and double logarithmic functions respectively, for the same period.

Results of these regressions, presented in Table 5.2 seem to indicate that the linear models are, on the same basis of the model statistics, most useful for analysing and predicting changes in demand for intermediate term credit, than the first difference and double logarithmic models. The R^2, F and D.W. statistics for the six models confirm this observation. Between the two linear models 2.11 and 2.21, it is readily evident upon close inspection of their results that Model 2.11 is a better candidate model than Model 2.21 even though the differences in their statistics are slight. Model 2.21 can be represented as follows:

$$YID = W_o + W_1 II + W_2 FI + W_3 TVA + W_4 MS + W_5 DPN + W_6 OUT + W_7 GNE + e$$

TABLE 5.2

RESULTS OF THE INTERMEDIATE TERM MODELS

MODEL	W_0	II	FI_{t-1}	TVA	MS	DPN	OUT_{t-1}	GNE	SE	F	DW	R^2	CV
RAW DATA	-677.2	-6.12	-0.01	0.32	2.00	-1.23	2.82	1.84	56.98	86.02 ·	1.51^{+}	95.97	15.7
2.11	-(3.97)	-(0.29)	-(0.29)	(2.28)**	(1.68)*	-(3.46)***	(2.55)**	(0.45)					
	-	0.12	0.47	1.57	1.56	1.45	0.96	0.41					
First Difference	4.77	0.17	0.02	0.20	2.26	-1.14	1.82	2.93	70.5	2.47	2.41*	30.06	160.6
2.12	(0.19)	(0.006)	(0.25)	(0.92)	(1.11)*	-(2.20)**	(1.31)$^{\circ}$	0.29					
Double Logs	-10.35	-0.02	-0.13	0.67	1.58	-0.43	0.98	0.24	0.17	58.9	1.19^{+}	94.1	3.14
2.13	-(4.75)	-(0.03)	-(0.61)	(0.95)	(1.55)$^{\cdot}$	-(0.95)	(2.00)**	(0.28)					
	-451.9	-4.04	0.05	0.29	2.37	0.81			63.29	96.5	1.37^{+}	96.0	17.5
2.21	-(2.79)	-(0.19)	(0.10)	(2.21)**	(1.99)**	-(2.61)**							
	19.8	-1.08	0.068	0.17	2.23	-1.09			6.99	3.16	2.49^{+++}	45.4	159.5
2.22	(0.98)	-(0.04)	(1.56)$^{\circ}$	(1.05)$^{\circ}$	(1.22)$^{\circ}$	(2.17)**							
	-8.35	-0.19	0.01	0.59	0.09	1.67			0.19	72.6	1.15^{+}	93.5	3.3
2.23	-(4.11)	-(0.36)	(0.06)	(0.82)	(0.23)	(1.67)*							

*** Significance at 99% level
** Significance at 95% level
* Significance at 90% level
$^{\circ}$ Significance at 80% level

$^{+}$ Inconclusive Evidence of Autocorrelation
$^{++}$ Positive Autocorrelation
$^{+++}$ Negative Correlation

$$YID = W_o + W_1 II + W_2 FI + W_3 TVA + W_4 MS + W_5 DPN + W_6 OUT + W_7 GNE + e$$

$$-677.17 \; -6.1211 - 0.01FI + 0.32TVA + 2.00MS \; -1.23DPN + 2.82OUT + 1.84GNE$$

$$-(3.97) \; -(0.29) \; -(0.25) \; (2.28) \quad (1.68) \; -(3.46) \; (2.55) \quad (0.45)$$

*** -0.12 -0.047 1.57 1.56 -1.45 0.96 0.41

$R^2 = 95.97$ F = 86.02 S.E.= 56.98 D.W. = 1.51 C.V. = 15.72

t values are in brackets

*** Elasticity estimates

The results of Model 2.11 implies that capital accumulation (TVA), the index of machinery, implements and other medium term input prices (MS), the index of physical production of agricultural produce (OUT) and depreciation costs (DPN) are important determinants of the demand for intermediate credit in the farm sector. The results of all the six models also indicate that the weighted interest rate on intermediate credit (II), net farm incomes (FI) and the Gross National Expenditure (GNE) are relatively unimportant variables. The comparatively low elasticity estimates for the three variables supports this claim.

Depreciation costs according to the results of Model 2.11 are the most important factors influencing the demand for intermediate farm credit. If the assumption is made that depreciatiin costs are valued based upon the declining balance method, a lower value of depreciation would then be associated with older or obsolete equipment which needs replacement. With rapid farm adjustments, the rate of technical and economic obsolescence could very well be relatively higher in the farming sector than in the other sectors of the economy. The upshot of this observation is that

the lower the depreciation costs, the higher the amount of intermediate credit and vice versa. The significance of depreciation costs in relation to the demand for intermediate credit, therefore, becomes understandable. A response (elasticity) estimate of -1.45 for this variable agrees with the explanation presented above.

Capital accumulation is also an important factor influencing demand for intermediate credit. As discussed in the previous section, this variable represents a command over assets which could be used as collateral in support of demand for credit by farmers. In addition, it also indexes the growth of the farming industry over the years. The expansion in the farm sector has been largely assisted mainly by increases in the substitution of labour by capital. Because of the unstable price and income situation in the farm sector, an increasing amount of capital investment has been partially financed with funds from external sources.

The price index for medium term inputs (MS) is also an important explanatory variable of changes in the demand for intermediate credit. The variables represent the cost of production and inflationary effects. The significance of this variable is, therefore, expected since inflation and the cost of the proposed investment are important variables in the theory of investment demand. The positive sign associated with the variable and the high elasticity estimate seem to attest to the observation made from the results. Changes in prices of inputs, therefore, exert an appreciable influence on the farmer's decision about borrowing intermediate credit.

The next important explanatory variable is the index of physical output of agricultural produce. The index not only represents the production

capability of Canadian farmers but also trends in the index is a simulator of technological progress in the farm sector over the last three decades. The rewards of technology have been enjoyed as a result of increased capital investment. The growth in capital investment has been made possible (especially in recent years) by resorting to external financing, because of the inability of farmers to meet all their investment needs from equity sources and also due to increasing awareness of the usefulness of credit by farmers.

The weighted interest rate on intermediate term credit (II) did not prove to be a significant explanatory variable in the model. Interest charges represent a relatively small protion of the total costs incurred in the production process. The investor aims at achieving an efficient production and maximizing the discounted presnet value of the stream of expected revenues due to the additional investment. Interest charges on intermediate term loans might, therefore, be unimportant to him in the short run especially if the variable costs are covered at the end of the current production period. Changes in interest rates might therefore, not be an important factor affecting the investment demand for intermediate term credit. The low estimated weighted interest elasticity of demand for intermediate term credit seems to support the above arguments.

A comparison of trends in net farm incomes and demand for machinery suggests a close correlation between the two.[1]

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[1] A.N. Book, "Farm Machinery", Canadian Farm Economics, Economics Branch, Canada Department of Agriculture, Vol. 11, No.6, December, 1976.

A closer inspection, however, reveals that significant drops in farm incomes did not affect the upward trend or increasing demand for farm machinery. The negative sign associated with the net farm income parameter, also indicates that as incomes fall the demand for intermediate term credit increases. This result agrees with the Residual Funds hypothesis. the relative insignificance of the variable in the model as a whole, however, makes the relevance of the Residual Funds hypothesis in the analysis and the prediction of changes in the demand for intermediate term credit, questionable.

The Gross National Expenditure variable did not show up as a significant factor influencing the demand for intermediate term credit. This finding was contrary to expectation under the theory of investment demand. Several researchers have noted that business cycle effects influence the demand for investment in the farm sector.[2] The insignificance of the GNE variable might also be due to the supressive effects of other variables present in the model, or may be due to the inappropriateness of the variable itself as a measure of business cycle and monetary policy effects on the farm sector. The results of the model, however, implies that external effects due to changing interest rates, farm incomes and gross national expenditure are not important determinants of the demand for intermediate term credit. A conclusion that might be drawn on the basis of the results is that a model based on variables incorporated in the classical and accelerator theories of investment will be more useful than models which include variables incorporated

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[2] J.A. Butlin, "The Effect of Canadian Business Cycles on the Adoption of Technological Innovations in Canadian Agriculture, 1926/1967", Canadian Journal of Agricultural Economics, Vol. 19, No.2, October, 1971.

in the classical and accelerator theories of investment will be more useful than models which include variables incorporated in the Residual funds and Bifurcation hypotheses for investigating the demand for intermediate credit in the farm sector.

Results of the Long Term Credit Demand Models

Models 3.11 and 3.13 are full, long term credit models fitted to annual data over the period from 1950 to 1975 in the linear (raw data), first difference and double logarithmic formulations, respectively. Models 3.21 and 3.23 are the reduced models for the same period. The regression results based on these models are presented in table 5.3. In these six models, the independent variables include the dependent variable lagged by one year. This lag variable will be used as a means for investigating the existence of a short run adjustment factor which might affect the demand for long term credit from year-to-year.

In Table 5.4 the result of another set of long term models from which the factor has been removed is presented. These models are used to investigate the long run demand for long term (real estate or mortgage credit). These models include 4.11 and 4.13 as the full, long term models in the raw data and double logarithmic formulations, respectively. 4.21 and 4.23 are the reduced models. The assumption underlying the specification of these models is that in the long run the effect of the adjustment factor will be negligible or that farmers would be able to effect complete adjustment in which case the factor (λ) becomes equal to unity.

The double logarithmic models are selected as most reliable on the basis of the statistical results. R^2, F and D.W.* statistics support the selection of the log model. In addition, the log models have relatively small coefficient of variations and standard error of the estimate than the raw data models.

Models 3.13 and 4.13 are selected as the most reliable models for investigating the factors which affect the demand for long term credit in the short and long run on the basis of the statistics associated with the full and reduced double long models (3.13,3.23, 4.13 and 4.23).

a) Results of the Short Run Demand for Long Term Credit Model

The results of the regressions performed based upon Models 3.13 in Table 5.3 indicate that short run changes in the demand for long term credit are mainly influenced by the interest charges on long term credit (IL), the gross national expenditure (GNE) and an adjustment factor (λ). Interest charges on long term farm credit showed a negative correlation with the demand for long term loans as was expected. This variable had t-statistic value which was significant at the 90 percent level. Even though the level of significance of this variable is not very high, its importance cannot be disregarded. Interest charges on real estate loans constitute a significant share of the total payment since the loans have a life span of over ten years. Interest rates on long term loans, therefore, might be an important factor affecting the demand for long term credit. Results of the regression indicate that the Gross National Expenditure (GNE) is positively correlated with the demand for farm real estate

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*The 'h' statistic was computed for each of the long term models and compared to the D.W. statistic. In each case there was no improvement in the measure of autocorrelation. This might be due to the small number of observations. It is recommended that the 'h' statistic is more appropriate for more than 30 observations. See Dale Orr, Applied Econometrics, Institute of Policy Analysis University of Toronto, (1977).

TABLE 5.3

RESULTS OF THE SHORT RUN DEMAND FOR LONG TERM CREDIT MODELS

MODEL		λ_{Y^o}	IL	FI_{t-1}	TVA	LB	OUT_{t-1}	YLD	GNE	λ	SE	F	DW	R^2	CV
RAW DATA	a	-142.4	-28.2	-0.0003	0.32	-3.24	0.42	1.34	4.37						
3.11	b	-(0.99)	-(1.37)°	-(0.006)	(0.86)	-(0.93)	(0.41)	(2.01)**	(1.25)°	-0.34	55.01	29.42	1.47+	88.8	26.2
	c	-	0.67	0.002	2.57	3.30	0.24	-	1.62						
FIRST DIFFERENCE		4.87	-9.50	0.46	0.36	-1.17	-0.83	0.15	-3.41						
3.12		(0.23)	-(0.41)	(0.91)	(1.23)°	-(0.49)	-(0.70)	(0.26)	(0.45)	0.85	56.01	1.85	1.46+	20.0	238.4
				-	-	-	-	-	-						
DOUBLE LOG	d	-4.88	-0.63	-0.22	0.61	-(1.33)	(0.51)	1.19	1.53						
3.13		-(1.25)	-(1.53)°	-(0.85)	(0.33)	-(0.61)	(1.06)°	(2.73)***	(1.56)**	-0.19	0.18	48.11	1.36+	92.9	3.55
3.21		-6.12	-15.55	0.005	0.45	3.33		1.19		0.19	54.4	41.7	1.17+	91.3	25.03
		-(0.08)	-(0.93)	(0.13)	(1.34)*	(1.00)		(1.89)**							
3.22		-4.52	-(4.58)	0.018	0.34	-1.34	-	0.25	-	0.75	53.97	2.65	1.47+	41.3	229.4
		(0.29)	-(0.21)	(0.54)	(1.25)*	(0.60)		(0.48)							
3.23		-3.56	-(0.13)	-(0.03)	1.35	-1.06	-	0.93	-	0.07	0.19	64.97	0.99+	92.75	3.60
		-(0.93)	-(0.48)	-(0.12)	(0.75)	-(0.48)		(2.29)***							

a Parameter Estimates
b t statistic values
c Elasticity Estimates
d Parameter estimates = Elasticity

*** Significance at 99% level
** Significance at 95% level
* Significance at 90% level
° Significance at 85% level

\+ Inconclusive Evidence for Autocorrelation
++ Positive Autocorrelation
+++ Negative Autocorrelation

credit. As the GNE increases, the demand for long term credit increases too. The significance of this variable at the 90 percent level implies that changes in GNE influence changes in the demand for long term credit to an appreciable degree. The GNE is considered as a lag indicator of the effects of monetary and fiscal policies and general business cycle trends in the economy. The relatively low level of significance of changes in the GNE to changes in the demand for long term loans may be due to the inability of monetary and fiscal policies to affect the farm sector as much as it would affect the non-farm sector. This argument is upheld when one is reminded of the inelasticity of demand for agricultural commodities compared to non-agricultural commodities. The relatively low level of significance of the Gross National Expenditure variable is, however, puzzling. Previous work by other researchers has indicated that business cycle trends affect the demand for farm inputs[4] and the lack of a strong show of significance might (as mentioned before) be due to mis-specification.

Examination of the results of the regressions in Table 3 reveals that the most significant variable is the lag (adjustment) factor. In Model 3.13, the adjustment factor was signigicant at the 99 percent level. The high level of significance might be due to the high correlation between the lag and the dependent variable ie. (YLD_{t-1} and YLD). The possible effect of this variable in suppressing the significance of other variables has been previously discussed. The results of the regression however, imply that the yearly demand for long term farm loans is affected by an adjustment factor. The negative value of the adjustment factor is unexpected and contrary to expectations under the theory of investment demand. Waugh[5] has

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[5] D.J. Waugh, "The Determinants and Time Patterns of Investment Expenditure in the Australian Sheep Industry", Bureau of Agricultural Economics, Quarterly Review of Agricultural Economics, Vol. XXX #2, Canberra, April, 1977.

reported a negative adjustment factor in his study on the determinants of investment for the Australian Sheep Industry. On the basis of his results he has questioned the restriction of the lag factor as a positive value. The negative coefficient associated with the adjustment factor, therefore, seems to suggest that a dampening effect is exerted on the demand for farm real estate credit as a result of the adjustment factor. The effect may be due to institutional and other factors which operate in the long term credit markets for farmers.

b) Results of the Long Run Demand for Long Term Credit Model

In the long run, demand for real estate credit in the farm sector seems to depend more upon capital accumulation and the index of farm real estate prices, with the interest rate on long term loans and gross national expenditure losing their significance as influential variables affecting the demand for long term credit. (See Table 5.4 for the regression results). The positive and negative signs associated with the capital accumulation parameter (TVA) in Models 3.13 and 4.13, respectively pose a problem of interpretation. There is also a reversal in the sign associated with the parameter on the index for land value. The signs in Model 4.13 are contrary to expectation under the theory of investment demand. Kraft has reported a positive correlation between the effect of a growth in farm incomes and the value of farm land in Manitoba.[6] The results of Model 3.13 agrees with his report. Capital accumulation (TVA) will be assumed to be directly correlated with increases in demand for long term credit and that the reverse is true for real estate price (LB).

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[6] D.F. Kraft, "What's Land Worth Now?", Occasional Series No. 6, Manitoba, Dept. of Agric Economics & Farm Management, Proceedings of the Agricultural Economics & Farm Management Conference Day, Dec., 1974.

TABLE 5.4

RESULTS OF THE LONG RUN DEMAND FOR LONG TERM CREDIT MODELS

MODEL		λ_{Yo}	IL	FI_{t-1}	TVA	LB	CUT_{t-1}	GNE	SE	F	DW	R^2	CV
RAW DATA	a	-168.2	-24.35	-0.02	0.28	3.26	0.73	3.00					
4.11	b	-(1.09)	-(1.10)$^{\cdot}$	-(0.43)	-(1.25)$^{\cdot}$	(2.28)**	(0.68)	(0.81)	59.29	28.9	1.21^{+}	87.0	27.3
	c												
FIRST DIFFERENCE		6.30	10.36	0.04	0.34	-0.71	-0.86	-4.01					
4.12		(0.26)	-(0.46)	(1.00)	(1.24)$^{\cdot}$	-(0.45)	-(0.76)	-(0.57)	54.6	2.26	1.38^{+}	43.0	234.1
DOUBLE LOG		2.82	0.06	-0.22	-(2.61)	3.73	0.33	0.46					
4.13		(0.90)	-(0.16)	-(0.75)	-(1.62)*	(2.83)***	(0.59)	(0.45)	0.21	40.96	0.94^{++}	90.5	4.10
		-42.74	-12.49	-0.01	-(0.13)	2.60	-	-					
4.21		-(0.57)	-(0.71)	-(0.26)	-(0.92)	(2.15)**			57.69	45.6	1.02^{+}	87.7	26.53
		-5.52	-5.73	0.03	0.28	-0.57	-	-					
4.22		-(0.36)	-(0.28)	(0.57)	(1.18)	-(0.37)			52.92	3.41	1.33^{+}	40.6	224.9
		3.01	0.10	-0.13	-2.04	3.41	-	-					
4.23		(1.08)	(0.39)	-(0.54)	-(1.88)**	(3.11)***			0.20	66.43	0.85^{++}	91.3	3.94

a Parameter Estimates
b t statistic values
c Elasticity Estimates

*** Significance at 99% level
** Significance at 95% level
* Significance at 90% level
. Significance at 85% level

\+ Inconclusive Evidence for Autocorrelation
++ Positive Autocorrelation
+++ Negative Autocorrelation

The low level of significance of the TVA and LB variables in Model 3.13 might also have been due to the existence of a high level of multicollinearity among the independent variables (See Appendix). The support for this claim comes from the results of Model 4.13 which revealed the importance of capital accumulation and real estate prices as significant explanatory variables at the 95 percent level. The statistical significance of the two variables was even more enhanced when two other insignificant variables were dropped. (See Model 4.23)

On the strength of the arguments presented, farm capital accumulation and the index of real estate prices will be treated as important determinants influencing the investment demand for long term credit in the farm sector. The short and long term elasticity estimates (same as the parameter values) lend support to the assumption made.

Capital accumulation over the years by farmers represent a command over assets which can be used as collateral in support of the demand for long term credit. The value of capital accumulation is also an indication of the extent of capitalization and increase in size of farm operations. As one would expect, farmers would borrow more money to expand their farming operations in order to remain efficient and competitive. The ability to obtain the loan is partly dependent upon the collateral they pledge in support of the loan demanded. So that as the farm wealth increases, the base for collateral expands and is made use of increasingly from year to year.[7]

Because of the major role played by land as an input in the production process of farm operations, real estate values would be expected

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[7] R.S. Rust, "Farm Business Financing and Taxation Relationships", Canadian Farm Economics, Economics Branch, Canada Dept. of Agriculture, Vol.9 #5, (October, 1974)

to be an important factor affecting the demand for long term credit. The negative sign associated with the real estate price variable implies that the demand for farm real estate credit is inversely related to real estate prices. This relationship seems to suggest that farmers borrow more in the long term credit market during periods of relative decreases in real estate values. This behaviour of farmers can be viewed as an attempt to increase the capital accumulation on farms in times of low real estate prices in order that purchase of land when prices increase is mimimised while capital gains are reaped in periods of increasing farm real estate prices as a result of appreciation in real estate values.

As is the case of the short and intermediate models, farm incomes proved to be an insignificant explanatory variable of changes in the demand for long term farm credit.

The summary of results in Tables 5.3 and 5.4 imply that short run (i.e. year-to-year) demand for long term credit is influenced more by external factors such as interest rates on long term loans, the gross national expenditure, adjustment factors which might be due to institutional and other restrictions and increases in land prices (due mainly to inflationary pressures). In the long run, however, farm capital accumulation and real estate prices are the most important determinants of demand for long term credit.

The foregoing analysis implies that yearly changes in the demand for farm real estate credit can be effectively investigated by employing variables based upon the Bifurcation, and to a lesser extent, the Residual funds hypotheses while long run responses can adequately be investigated through the employment of accelerator-residual funds variables.

Structural Stability of the Long Term Credit Models

The data set was divided into two sets to enable an examination which will determine the existence of structural change in the model applied to the two sets. One set of data covers the period from 1950 to 1960; the second set of data covers 1961 to 1975. The structural test will examine the effect of the institution of the Farm Credit Corporation since 1960 on the operation of the long term credit market. The creation of this Crown Corporation and the method of its operation in the market has given rise to several questions and criticisms. The crux of the controversy relates to (i) the method by which money for loans are raised by the Corporation: (ii) the use of concessionary interest rate on loans and (iii) the existence of a fixed limit in loans supplied by the Corporation.

Several other public Credit Agencies (e.g. the Manitoba Farm Credit Corporation and the Alberta Agricultural Development Corporation have been created in other provinces by the Provincial governments. These agencies operate in a similar fashion as the Farm Credit Corporation. Structural tests were performed on the short and long run models as a means of investigating any changes in the operations and performance of the long term market . Any such changes in the operation of the long term credit market might be attributed to the increased Government involvement in the long term credit market since 1960. Chow's tests for structural stabibility was employed in the attempt to investigate possible structural changes.

Results of the tests performed on the long and short run models however indicate that neither in the long nor short run are there any

structural changes in the long term credit market. On the basis of these results, therefore, it is doubtful that the suggestion that governmental involvement in the long term credit market alone has had any significant effect on the operations of the market. The fact that government agencies have been operating in the long term credit market for the farm sector since the depression years lends support to the result of the analysis. It is also quite possible that the test used in this analysis to capture the effect of change towards more restrictive credit policies since 1960, have not been effective.

Summary of Long Term Models

The investigation into determinants of the Investment demand for long term farm credit revealed that farm wealth, inflation and increasing land costs, changes in the GNE, interest charges on long term loans and an adjustment factor are the most important variables influencing the decision of borrowers. Economic analysis of the long term market controversy seems to support the critics of government intervention in the long term credit market, to a fair degree. A few suggestions could be advanced solely on the basis of the findings in this study and their implications on these results.

Because of the relative interest inelasticity of the demand for long term credit, changes in the response of lenders to improved lending conditions in the long term market will have a substantial effect in reducing interest rates and increasing the potential demand for long term

credit. The more elastic the supply response, therefore, the more the gains to both the borrowers and lenders (See Figure 5, SF_1 and SF_2). Some of the methods by which the response or interest in the long term credit market of private agencies could be increased have been discussed by several researchers.[8]

In the long run farmers will have to repay loans or borrowed money or lose their asset. The ability of farmers to repay their loans depends (in the final analysis) on their capacity to generate attractive revenues from the production process; to cover both business and household obligations. Failure to make profit over time might result from inefficiencies in operation, fluctuations in yield due to natural and other uncontrollable factors and a stable and improved product price conditions. If the demand for credit increases over the years without a comparative increase in product prices and, therefore, farm incomes, indebtedness will be the end result. The Canadian farmer is technically efficient given the inputs used in the production process. However, poor product prices have led to fluctuating and declining farm incomes. The effects of a decline in incomes are felt most by the low income farmers, mainly due to excess profits gained in production through scale effects. These efficient farmers comprise about 30 to 40 percent of the total number of operators.[9] Estimates of the income elasticity of demand seem to suggest that farm credit is on the whole an inferior product, since demand declines as income rises. Trends in farm adjustment

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[9] R.S. Rust, op. cit., Canadian Farm Economics, Vol. 9, No.5 (October, 1974).

over the last three decades generally point to increasing farm sizes in which more capital will be employed in production. Small farms will, therefore, be less efficient in time and will, therefore, be more difficult to finance.

Chartered Banks and other private lending agencies have been servicing the efficient, high income and large farmers on the basis of their profit and their relatively high repayment ability for several years. It is the belief of the author that their services could be extended more readily if the income situation of the other borrowers and, therefore, their ability to repay loans were improved. Such a trend of affaris coupled with the institution of an insurance programme for farm real estate credit in the long term market as proposed by Dr. Brake, would go a long way to aid in the attempt to draw attention of the private lender to the agricultural sector.

The declining incomes effect might also be responsible for the negative adjustment (expectation) factor reported in the study of the factors influencing the demand for long term credit. As discussed already, declining incomes indicate to farmers that increases in investment might not be profitable in the future. So that period of improvement in economic activity might be viewed by the farmer as merely transitory. The effect of the wait and see attitude then results in a reduction in the rate of demand for net investment even though total investment increases year by year. In this argument is accepted, the clain by the critics of governmental intervention in the credit market can be challenged. Another basis for supporting the challenge is the lack of show of structural change

in the long term models for the entire period under the study. However the occurrence of a negative adjustment coefficient could be due to both the declining incomes effect and the conditions of operation of the various government lending agencies.

The Structural Organization and Performance of the Long Term Farm Credit Market

A study of Table 5.1 reveals that the long term credit market for the farm sector is very highly concentrated. The dominant group being government agencies. As a group, the government agencies control over 85 to 90 percent of the total market. The near monopoly of the real estate market by these government agencies is enhanced by the extension of long term loans at subsidized or concessionary rates caompared to the private lenders operating in the market. Loan budgets in many cases are decided by the Finance and Treasury Departments, Federal and various Provincial Governments. Because of the fixed total budget voted for long term farm credit for each year and the existence of several restrictions associated with lending, the total potential demand for long term credit is usually in excess of the amount of long term credit actually extended each year.[10] The restrictions that are associated with the operation of the public agencies in the long term market and the surplus demand that results due to these restrictions is especially important for borrowers who have not collateral or who have only a small amount of equity capital. The use of concessionary interest rates, the issue of fixed loan limits and the method of generating loanable funds by these

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[10] M.F. Andal, "Economic Guidelines for Present and Future Capital Use in Canadian Agriculture", Canadian Journal of Agriculutral Economics, (Nov., 1959). See also J.R. Brake, op. cit., Annual Report of the Farm Credit Corporation, 1975 to 1976.

agencies, especially in the case of the Farm Credit Corporation have been criticised by several writers. Also the attempts to maintain the family farm units have been questioned. These critics have alleged that the existence and mode of operation of these government agencies have resulted in 'crowding out' private lending agencies from the market. Others support the existence of the government agencies in the credit market. The supporters of government intervention in this market note that the Chartered Banks and other private lending agencies both previously and at the present have been reluctant to operate in the long term credit market because of the relatively low returns and the high price and yield fluctuations associated with the farm sector. Most private lending agencies prefer to deal with the medium to large farmers since they are more efficient and are able to pledge support for their loans. The poorer farmers or the new farm operators find it difficult to raise loans under such conditions even though they might be more experienced. Some of the credit policies of the Government agencies seek to identify such less fortunate operators to assist them to maintain economically viable farm units. Private lenders have not exhibited any interest in addressing themselves to these problems.

Some of the Government agencies, notably the Farm Credit Corporation have performed efficiently as Credit agencies and the experience gained by their officials in the credit market is invaluable. The best solution might be to redefine certain aspects of the operation of these agencies so as to eliminate some of the effects of some of the restrictions surrounding their operations.

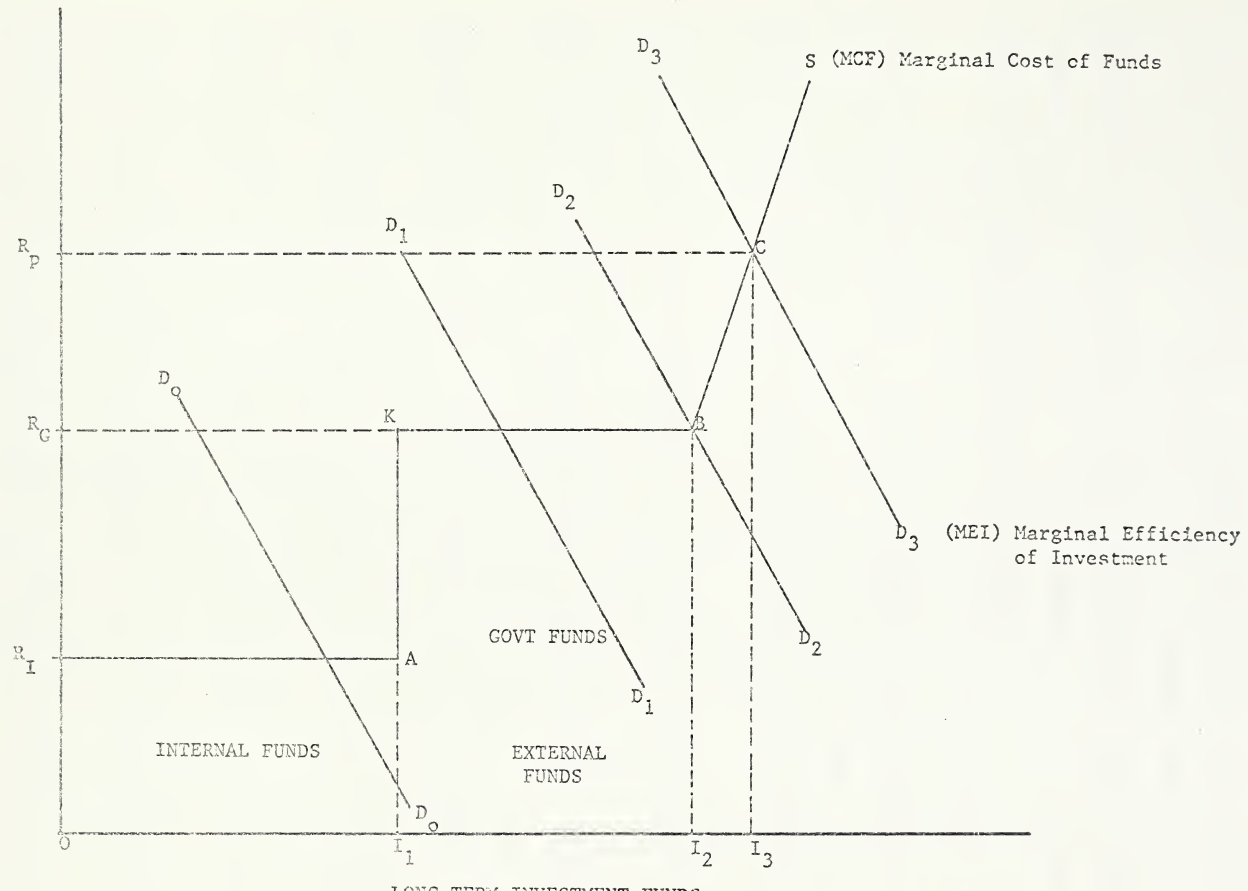
Theoretical Basis of the Long Term Market Controversy

The sources for long term credit include retained earnings and farm credit supplied by government and private lending agencies. Figure A is a diagrammatic representation of all funds available for long term investment. R_I A K B C S trace the different kinds of funds available. R_IA represents equity funds with a corresponsing interest rate of R_I. The cost of capital or the opportunity cost associated with such internally generated capital is assumed to be lower than debt funds. K B represents total budget of government agencies for long term credit at a weighted concessionary interest rate of R_G, for a particular year. BCS represents the private long term credit supply function with the different and increasing interest rates. Together these segments form the aggregate supply curve for long term farm credit. Since this curve traces the cost of internal and external funds, including the risks and opportunity costs associated with them in each year, it can also be referred to as the marginal cost of funds scheduled for the particular year concerned.

$D_oD_1D_2D_3$ are aggregate demand curves for long term credit for a season. They represent a possible demand for farm credit. D_o is an aggregate demand curve for a situation where investment demands for funds are low due to different reasons and, therefore, all of the investment needs are supplied from internal funds whose cost is least. D_1 represents a situation in which investment funds required exceed the internal funds available for long term investment. The excess requirements are borrowed from

FIGURE 5.1

DIAGRAMMATIC REPRESENTATION OF A HYPOTHETICAL
AGGREGATE DEMAND AND SUPPLY CURVES
FOR LONG TERM FARM CREDIT IN CANADA

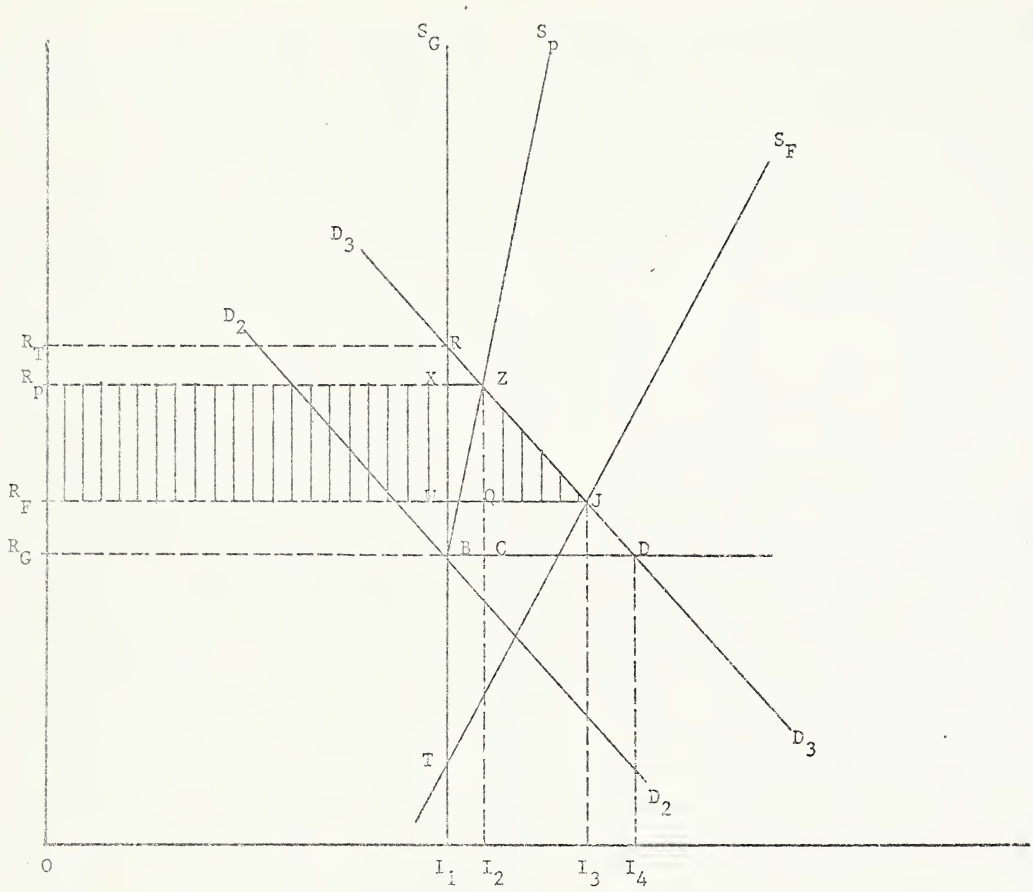


government agencies. D_2 represents a situation in which the government funds are exhausted and D_3, the demand for surplus long term investment funds on the private credit market. The assumption underlying this diagrammatic representation is that the opportunity cost of internal funding is lower than that of external funding. For the present, we will assume this assumption holds for all farmers.

Figure B represents the credit markets for government and private investment funds. R_G is the weighted concessionary interest rates charged on government loans, and OI_1 is the total budget for long term credit supply voted for the various government lending agencies. On per farm basis this may also be taken as representing an upper limit on loans extended by these agencies. If the market should be cleared and exhausted, the demand for credit must intersect the supply curve at B. This situation can be represented by D_2. Because of the limitations that exist in the long term market the true demand curve is usually beyond D_2. This hypothetical demand curve is represented on this diagram as D_3, with BD representing the hypothetical surplus demand for long term credit. BD incluses demand for government funds by operators who do not meet the terms of those agencies and those who have exhausted their credit with these agencies but require more funds. (This is especially true of new farm entrants). These farmers will have to meet these needs for excess funds from the private market. The supply curve for the private market is represented by BZS_p. In the absence of any other sources of finance apart from internal and government funds, the potential interest loss which would have been incurred by government agencies can be represented by $R_T - R_G$. The differnece is the opportunity or true cost of capital owing

FIGURE 5.2

DIAGRAMMATIC REPRESENTATION OF THE LONG TERM MARKET UNDER FREE MARKET FORCES



to the potential scarcity of funds for lending and total loss to public treasuries because of this phenomenon. It could be equal to the area $R_T R_G DR$. The area RBD represents lost potential business because of the budgetary and upper level restriction placed on individual loans and also the non-credit worthy individuals who applied to the public agencies. Farm operators who have been denied credit or exhausted their credit with the public agents might obtain loans from the private markets at considerably high interest rates because of the true cost of mortgage funds owing to the fact that higher risks are involved in long term lending. In addition, more attractive opportunities other than farm financing exist for investing long term funds and the private agencies are more interested in financing such investments. R_p represents this weighted rates on private investment funds. The private agencies, therefore, cater for additional demand for credit equal to BC.

A number of writers have criticized this structural organization of the credit market. Lee[11] for example, has reported that there exists a potential for the expansion of the long term credit market in the event that certain methods of raising investment funds and lending are changed. He put forward some proposals which might aid in the promotion of private participation in the long term credit market. The supply curve S_F might result if the proposals advanced by Dr. Lee were adopted. The influx of funds into the long term credit market would make the supply curve more elastic. The resultant free market interest rate would be equal to R_F with an increase in the amount of credit extended by all agencies from OI_2 to OI_3. This implies that the involvement of government lending

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[11] Warren F. Lee, "Funding of Farm Mortgage Credit in Canada", Unpublished paper.

in the long term credit markets cuts down potential level of business by a difference of $OI_2 - OI_3$. The gain to borrowers due to reduced interest rate charges would be equal to the area $R_P Z_J R_F$ under existing demand conditions. This represents an increase in consumer surplus to borrowers. $R_F JDR_G$ shows the potential loss of interest to government due to subsidization of interest rates paid on credit .

The area $R_P ZJR_F$ also represents an abnormal profit enjoyed by private lending agencies currently engaged in the long term credit market. It also represents the added real risks and opportunity costs involved in operating in the long term market for agricultural credit. There would be an increase in producer surplus as a result of the expansion in the credit market when free market forces operate. This increase in producer surplus is represented by the areas XZBQ (the original surplus) to WJT (the resultant surplus).

The result of the analysis is thus evident. Under free market operations with no restrictions, there is a gain to both lenders and borrowers since the market is expanded and cost of capital is reduced.

So far, we have not considered the type of demand curve faced by lenders in the market and the possible effects of changes in elasticity of demand. Figures 3,4 and 5 explain the effects of changing elasticity of demand for long term credit. Diagram 3 represents a situation in the long term market when supply shifts as a result of the additional funds on the market under different elasticities of demand conditions. The equilibrium interest rate on loans will then be lower than r_o where r_o is the original interest rate charged on loans by private lenders. The more inelastic the demand for credit, the lower the interest rate

EFFECTS OF CHANGES IN THE ELASTICITIES OF SUPPLY AND DEMAND

FIGURE 5.3

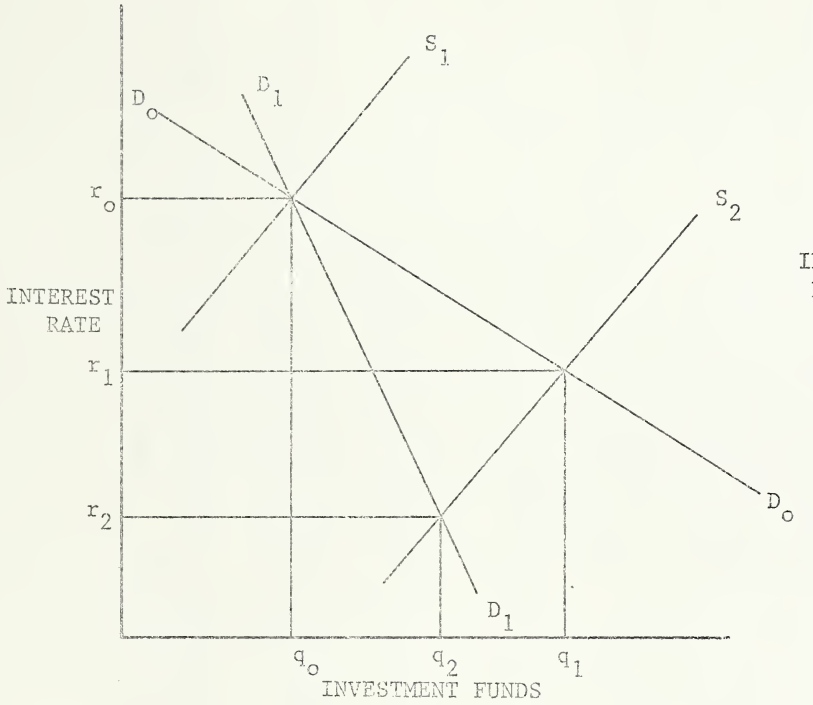
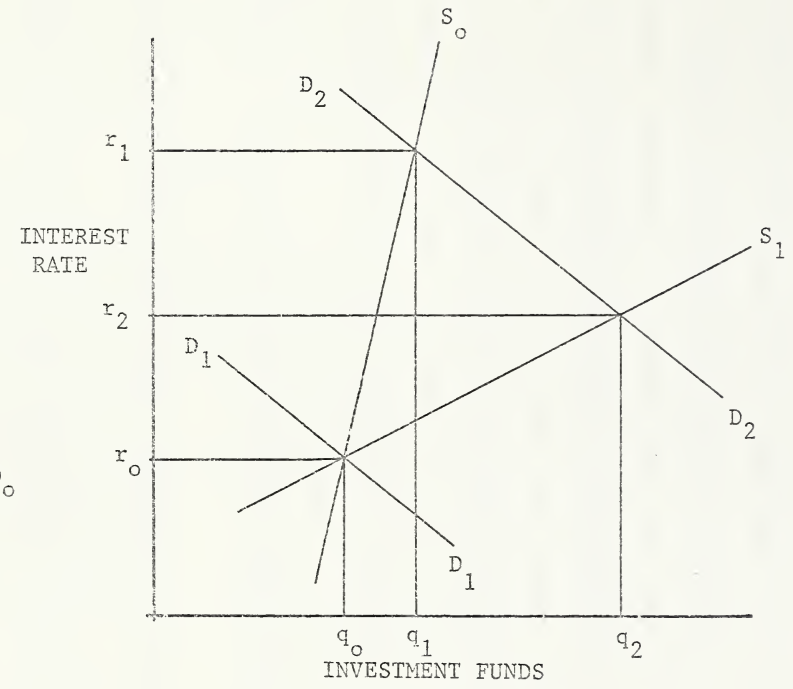


FIGURE 5.4



charged on loans, but the increase in the additional quantity of credit supplied is reduced if the demand for credit is inelastic.

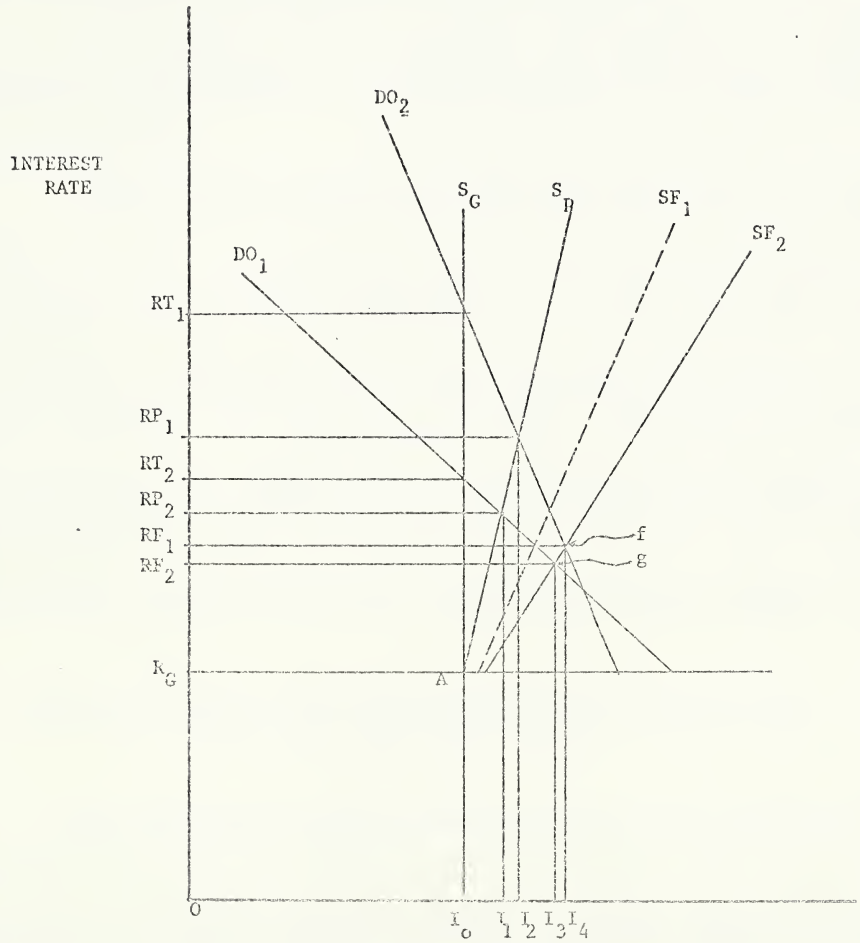
Diagram 4 represents a situation where the demand for credit shifts from D_1 to D_2. In this case an increase in the demand for credit is associated with an increase in the interest rate charged. The more elastic the supply curve for long term credit, the lower the interest rate charged and the increase in the demand for long term credit is more than the increase in quantity demanded under conditions of inelastic supply. The shift in demand means an increase in the quantity of money taken away from the market. The more elastic the supply of money on the market, the lower the interest charges on loans.

Combining diagrams 3 and 4 under a condition of increasing inelasticity of demand and an increasing elastic supply curve, the net result is an increase in the amount of credit extended at a considerably lower interest rate. The forces represented in both diagrams exert a downward effect on the interest rate (See Figure 5). The end result will depend on the relative response of borrowers and lenders of credit (demand and supply elasticity) to the conditions on the credit market. On the whole, however, there will be a net decrease in interest charges and an increase in the equilibuium quantity of credit in the market. How much benefit accrues to consumers and lenders will depend upon their response to changes in the interest rate and other conditions in the credit market.

Another conclusion is reached based upon the assumption of an inelastic demand curve for long term credit and an elastic supply curve for long term credit. The more inelastic the demand for farm credit is, the greater the increase in the consumaer surplus. This is represented by the

FIGURE 5.5

EFFECT OF CHANGES OF THE ELASTICITY OF DEMAND AND SUPPLY FOR LONG TERM CREDIT



designated areas in diagram 5. $DOgRF_2$ represent the gain to borrowers under an elastic demand curve and $DNfRF_2$ represents the gain to borrowers under inelastic demand conditions. Similarly, the producer surplus is increased as the demand for credit becomes more inelastic. This is represented by areas RF_2gS_F and RF_1fS_F. As the supply becomes more elastic, the increase in producer surplus is also increased.

On the strength of this analysis, the argument of the group favouring non-governmental involvement in ageicultural credit have a strong theoretical basis.

A shift in the equilibrium demand and supply for long term farm credit will exert a positive influence on the demand for intermediate and short term credit. This interrelated effect would, therefore,result in an increase in demand not only for long term loans but also for intermediate and short term loans in the absence of government involvement in the long term credit market. It is conceivable that this phenomenon will create multiplier effects which will be beneficial not only to the agricultural economy but also for the non-agricultural economy.

A Re-Examination of the Controversy based on the Results of the Long term Market Models

The investigation into the determinants of the Investment demand for long term farm credit revealed that farm wealth, inflation and increasing land costs, changes in the GNE, interest changes on long term loans and adjustment factor are the most important variables influencing the demand for long term credit in the short run. Economic analysis of the long term market controversy seems to support the critics of government intervention in the long term credit market to a fair degree.

A few suggestions could be advanced solely on the basis of the findings in this study and their implications on these results.

Because of the relatively high interest elasticity of demand for long term credit in the short run, changes in the response of lenders to improved lending conditions in the long term market will have a substantial effect in reducing interest rates and increasing the total potential credit market. The more elastic the supply response, therefore, the more the gains to both borrowers and lenders. (See Figure 5 SF_1 and SF_2). Some of the methods by which the response or interest in the long term credit market of private agencies could be increased have been discussed by several researchers.[12] In the long run, farmers will have to repay their loans with borrowed money or lose their assets. The ability of farmers to repay their loans depends (in the final analysis) on their capacity to generate attractive revenues from the production process, to cover both business and household obligations. Failure to make profit over time might result from inefficiencies in operation, fluctuations in yield due to natural and other uncontrollable factors and a stable and improved product price condititons. If the demand for credit increases over the years without a comparative increase in product prices and, therefore, farm incomes, excessive indebtedness will be the end result. The Canadian farmer is technically efficient given the inputs used in the production process. However, fluctuating and declining product prices have led to fluctuating and declining farm incomes. The effects of a

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[12] J.R. Brake, "Future Capital and Credit Needs of Canadian Agriculture", Department of Agricultural Economics, University of Guelph, Publication No. AE 70/3.

decline in incomes are felt most by the low income farmer and to a lesser extent by the middle and high income farmers. This is mainly due to excess profits gained in production through scale effects. These efficient farmers comprise about 30-40 percent of the total number of operators.[13] The results of the analyses indicate that farm credit on the whole is an inferior product, with demand declining as incomes rise. Trends in farm adjustment over the last three decades generally point to increasing farm sizes in which more capital will be employed in production. Small farmers will, therefore, be less efficient in time and will, therefore, be more difficult to finance.

Chartered banks and other private lending agencies have been servicing the efficient, high income and large farmers on the basis of their profit and their relatively high repayment ability for several years. It is the belief of the author that their services could be extended more readily if the income situation of the other borrowers and, therefore, their ability to repay loans were improved. Such a trend of affairs coupled with the institution of an insurance programme for farm real estate credit in the long term market as proposed by Dr. Brake[14] would go a long way to aid in the attempt to draw the attention of the private lender to the agricultural sector.

The declining incomes effect might also be responsible for the negative adjustment (expectation) factor reported in the study of the factors

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[13] R.S. Rust, Canadian Farm Economics, Vol.9, No.5, (Oct, 1975)

[14] J.R. Brake, "An Assessment of the Credit Recommendations of the Federal Task Force on Agriculture", op. cit.

influencing the demand for long term credit. As discussed already, incomes indicate to the farmer that increases in investment might not be profitable in the future. So that a period of improvement in economic activity might be viewed by the farmer as merely transitory. The effect of the wait and see attitude then results in a reduction in the rate of demand for net investment even though total investment increases year by year. If this argument is accepted, the claim by the critics of governmental intervention in the credit market can be challenged. Another basis for supporting the challenge is the lack of show of structural change in the long term models for the entire period under the study. The occurrence of a negative adjustment coefficient could, however, be due to both the declining incomes effect and the conditions of operation of the various government lending agencies.

Further Implications of the Results on the Long Term Models

The factors that influence the decision of borrowers in the long term credit market might have an effect on the decision relating to demand for credit in the short and intermediate term markets. Various minimum combinations of resources are needed in the production process in order that acceptable levels of technical and economic efficiency be achieved. Because land is the most important input in farm production, decisions on how much of other inputs to be purchased are made after the size of the land has been determined. This observation is especially true for crop production. In this context, therefore, the factors which

influence the demand for long term credit during farm expansion indirectly influence the decision to invest in other inputs. The final decision on real estate investments can, therefore, generate negative or positive multiplier effects is important.

The existence of a negative adjustment factor in the long term model and the significance of this factor (whether due to a declining income effect on investment or the existence of restrictive practices surrounding the operation of Government credit agencies in the long term credit market), can be expected to have multiplier effects on demand in the short and intermediate credit markets which would led to a smaller total demand for all three types of credit. In addition, the significance of the GNE variable in the long term market model (3.13) also seem to indicate that changes in GNE might have an indirect effect on the demand for short and intermediate term credit. An implication of the above statement is that generally, the total demand for types of credit is affected in some measure by changes in the business cycle.

Limitations of the Study

Several problems encountered in this study do limit its usefulness. These limitations are the result of several factors.

Data

The availability of data for the study has been the most limiting factor during the whole process of researching for the study. Several modifications to the data and approximations had to be effected so as to make them more reliable. Of special importance is the lack of data on short, intermediate and long term credit extended during the period from1950-1960. This fact makes the test for structural changes based upon estimates of the long term credit extended quite unreliable. The seriousness of this problem becomes more real when one is reminded of the fact that a large number of dependent variables were regressed on these estimates. Data on interest rates were just as difficult to obtain. Several sources were consulted and despite the effort made to make accurate and reasonable modifications in order to arrive at the weighted interest rate figures for the various types of credit, the accuracy of the final estimates cannot be vouched. A more realistic variable which could have been used in the study instead of the net farm income, is the total farm revenue. The variable would include both farm off-farm and non-farm earnings for each current year. Several sources including Taxation Statistics published by the Department of National Revenue were consulted to enable a computation of this variable. Had these data been available, the effects of transitory incomes or windfall

gains on the investment demand could have been investigated. The lack of the data covering the whole period under study however, made the attempt a futile one. Total farm wealth which may be defined as the level of capital accumulation plus savings on profit should have been incorporated in the model rather than the total value of assets. Lack of data on savings by farmers presented a problem in this respect and thus the capital accumulation on farms was used as an index of farm wealth. The attempt was made also to capture the effect of technology, if any, on the investment demand for farm credit. The use of the index of physical output of agricultural produce as a "cath all" variable for technical progress is questionable. The use of the interest rate to monitor the impact of monetary policy on the demand for farm credit cannot pass without comment. Most of the interest charges on long term farm loans are fixed by Government legislation and do not increasingly reflect changes in policies which might affect the demand for long term credit. Price indexes for the various inputs had to be relied upon because of the lack of data for certain inputs in some years, or over the entire period for which the study has been designated to cover. Brake has met with similar limitations in his study mainly due to unavailability of data and describes this condition adequately.[15]

Model Specification

Single equation models are used in the study. Both Klein (as reported in Waugh's work) and Brake have noted that the simultaneous nature of the economic relationship underlying investment decisions and the cash

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[15] J.R. Brake, "Future Capital and Credit Needs of Canadian Agriculture", op. cit.

flow model should not be overlooked. Waugh has stated in his study that Klein notes:

> "Simultaneous bias may be of limited importance in estimation of investment equations if the explanatory variables have a pure lag effect. As long as the data are quarterly, monthly or for a shorter unit period, the existence of a pure lag effect gains plausibility. For the case of annual (or longer unit period) data, simultaneity is more significant and should not be ignored in the estimation procedure." 16

Waugh goes on however, to explain that:

> "Treatment of distributed lag estimation in the context of simultaneous equation, however, poses difficulties. Whilst formal treatment of such problems is only now being developed, an initial application of single equation techniques using important candidate variables may prove useful in obtaining indication of lag lengths. By specifying these lags in a system of simultaneous equations and applying appropriate techniques, coefficients can be estimated." 17

Brake has also expressed the same view in one of his works.[18]

Since the study is basically an initial attempt to establish important candidate variables and the possible effects on demand for credit of various institutional and other constraints on the Canadian farm credit markets, the use of single equation models in the study may be acceptable. This position is supported by the fact that some of the limitations mentioned by Brake have been encountered in the present study despite the effort made in the search for data over a fairly extensive period of time. A small number of observations relative to

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[16] D.J. Waugh, "The Determinants of Investment in Australian Agriculture -- A Survey of Issues", op. cit.

[17] Ibid.

[18] J.R. Brake, "Future Capital and Credit Needs of Canadian Agriculture", Department of Agricultural Economics, University of Guelph, Publication No. AE 70/3.

the number of independent variables were used to test for the structural stability of the long term model. Because of the existence of a high degree of multicollinearity among the variables, the estimates obtained from the models are highly suspect.

Multicollinearity and Autocorrelation

Only few time series models can be entirely free of multicollinearity and autocorrelation. Orr describes the problem of Multicollinearity thus:

> "When there is a linear relationship between one independent variable and the other independent variables in an equation, it becomes difficult to isolate and identify the true partial impact of that independent variable. This is the problem of multicollinearity, the most pervasive of all problems in multiple regression." 19

The problems of multicollinearity among the independent variables can cause a suppression of statistical significance of variables that are otherwise important in the model. The effect of multicollinearity is more important when analysis rather than prediction of future trends is the purpose of estimating the model. In a few cases, the exclusion of certain variables e.g. the lag factor in the long term model exposed the previously insignificant capital accumulation index of real estate price variables as statistically significant. Theis phenomenon can be attributed to the existence of multicollinearity among the indiependent variables because of the presence of the lag factor in the model. The relatively low level of significance of several variables in the models despite the statistically significant R^2 values of the models indicates the likelihood of a high level of multicollinearity. Neither the reduction in the

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19 Dale Orr, op. cit.

number of independent variables in each of the models, nor the use of the first difference formulations seemed to improve the situation. Thus it was concluded that even though the level of multicollinearity among the mosels is high, it can be regarded as not very serious and especially so because of the high and statistically significant R^2 values.

In econometric analysis, one of the fundamental assumptions is that successive error terms associated with each observation are independent (ie. zero covariance among the error terms). A violation of this assumption leads to the problem of autocorrelation. Autocorrelation arises often in time series analysis because of the cyclical or trend nature of the data encountered in the time series studies. The existence of autocorrelation makes estimates of the model inefficient. As Orr explains:

> "Autocorrelation causes inefficiency, but does not bias the true variance of the regression coefficient and the standard error of the estimate are underestimated by OLS in the presence of positive autocorrelation." 20

The Durbin Watson (D.W.) test was used to test for autocorrelation in the short and intermediate term models. The 'h' test (a modified form of the D.W. test) was also used to test for the presence of autocorrelation in the long term demand models because of the inclusion of a lag form of the dependent variable as one of the explanatory variables. Estimates from the two statistics did not suggest any differences in results due to the use of the 'h' statistic. This might be because of the insufficient number of observations used in the study since the 'h' statistic is more relevant for the higher number of observations. In

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[20] Dale Orr, op. cit.

addition to correcting for multicollinearity in the models, the first difference formulations were used as a special case to correct for the existence of autocorrelation in the data. Results based on the statistics of the models suggest that the first difference formulations did not improve on the results of the original equations. Apart from the problems discussed already, other limitations such as inaccuracies on the observation of variables may exist. These defects might also add to the limited usefulness of the study even though the influence of such effects may be considered as very slight compared to the ones discussed already.

Summary

In this Chapter, results of the analyses based upon the models developed in Chapter IV were discussed.

The overall results of the investigation of the determinants of the three types of farm credit reveals the importance of capital accumulation, inflation and costs of inputs as factors which influence the demand for all kinds of farm credit.

Technological development seems to influence the investment demand for short term (production) and intermediate term credit, but not real estate credit.

Net farm incomes did not show up as a very significant variable affecting demand for credit, especially for the intermediate and long term credit. The results, however, indicate that farmers would tend to meet their investment needs from equity sources first for the purchase of short term production inputs. No such evidence is forthcoming in the

case of demand for intermediate and long term inputs such as machinery and land. The relevancy of the Residual funds hypothesis under such circumstances is, therefore, questionable.

Interest charges on short and long term credit are important variables affecting demand for credit, but not so for intermediate credit.

The Gross National Expenditure (which was used to monitor business cycle effects) showed up as an important determinant only of demand for long term credit but not for short or intermediate credit. The relatively weak show of interest rates and the GNE variables on the whole indicates that demand for long and intermediate term credits can be effectively investigated only by employing a combination of variables based upon the Accelerator and Bifurcation hypothses.

The presence of significant negative adjustment factor in the long term credit model seems to support the adoption of the Accelerator-Bifurcation hypotheses. The section which followed dealt with a discussion of the structure and performance of the long term farm credit market. Emphasis was placed on the effects of governmental involvement (Federal and Provincial) in the long term credit market. Results based on the short run long term credit model point to the existence of a negative adjustment coefficient. Two reasons were advanced as possible explanation of this occurrence, the declining income effect of investment demand for farm credit and the existence of restrictive lending policies in the long term credit market. In the final section of the Chapter, the limitations of the study were discussed.

The next Chapter includes a summary of the five previous Chapters, major observations, conclusions and suggestions.

CHAPTER VI

SUMMARY, CONCLUSIONS AND SUGGESTIONS

Summary

The study attempted to investigate the determinants of the investment demand for short, intermediate and long term (real estate) farm credit in Canada. The period under study was from 1950 to 1975. After the background to the problem had been discussed and specific issues identified, an outline of the objectives, hypotheses, method and organization of the study was presented. Developments in the agricultural industry with special reference to changes in the organization of farm production were investigated. Emphasis was placed on the role of technology in the structural transformation of the farm sector. The role of capital investment in the transformation process was investigated. Sources and types of farm credit were discussed in addition to trends in the demand for the different kinds of farm credit. The structural set up, characteristics and trends in indebtedness for all types of credit, were also investigated. Following a review of the concepts of demand and supply, the demand for farm credit was introduced as a derived demand for farm investment inputs. The review of various investment demand theories followed, stressing the development of investment theory and its candidate variables. An integrated investment theory resulted from the theoretical review. A short survey of previous work relating to the present research was made. This survey dwelt mainly

on the work of Dr. J.R. Brake. An approach to the present study was proposed following the theoretical review and evaluation of Dr. Brake's work. Models were developed to analyse the demand for the short, intermediate and long term credit. These models were used to perform tests and investigations in accordance with the set objectives and hypotheses laid down for the study. The Ordinary Least Squares (OLS) method was used in estimating the significance of the candidate (independent) variables in explaining changes in the dependent variable. Linear formulations (raw data, and double logarithmic) were tested for all types of credit - short, intermediate and long term). For the short and intermediate term credit demand, single equation multiple regression models were used in estimating the response of farmers to the independent variables. (See Table 6.1) Two models were developed for analysing the demand for long term farm credit. One model was designed to reflect and predict the short run (year-to-year) changes in the demand for long term credit and especially, the possible effect of institutional and other restrictions and limitations on the extension and demand for long term credit. The second was a long run model in which the limitations had been adjusted. This model depicts the changes in the demand for long term farm credit in the long run. Structural tests were performed on the long term credit market to investigate any changes in the demand for farm credit which might have occurred due to the effect of increasing governmental (Federal and Provincial) involvement in the long term farm credit market. The results of the analyses performed based on the models developed were discussed on the basis of selected statistics and with reference to the hypotheses advanced at the beginning of the study. Representative models were selected from a group

TABLE 6.1

A SUMMARY OF ELASTICITY ESTIMATES FOR THE SELECTED DEMAND MODELS

SHORT, INTERMEDIATE, AND LONG TERM (SHORT AND LONG RUN)

MODEL	WEALTH	INPUT PRICE	INCOME	INTEREST	DEPRECIATION	OUTPUT	GNE	INVENTORY	COEFFICENT ADJUSTMENTS
Short Term 1.11	1.08***	0.55**	0.16°	0.31**	-	0.48**	0.16	0.015°	-
Intermediate term 2.11	1.57***	1.56*	0.47	0.12	1.45***	0.96**	0.41	-	-
Short-Run Long Term 3.13	0.33	0.61	0.85	1.53*	-	1.06°	1.56**	-	-0.19**
Long Run Long Term 4.13	1.62*	2.85**	0.75	0.16	-	0.59	0.45	-	-

*** Statistically significant at the 99 percent level
** Statistically significant at the 95 percent level
* Statistically significant at the 90 percent level
° Statistically significant at the 80 percent level

of models for each type of farm credit -- long, intermediate and short term. The results relating to the individual independent variables in the selected models were presented. In addition, response estimates were calculated for selected variables and their implications were discussed.

Following the analysis of the results for long term credit demand was a discussion of the structure and performance of the long term credit market. The problems and critiques of the present structural organization of the long term market were discussed. A brief theoretical background to the long term farm credit market (real estate) controversy was presented. The results of the analyses for the long term market were re-assessed with reference to the theoretical analysis of the controversy surrounding the performance of the long term market. The possible multiplier effects of the structure and performance of the farm real estate credit market on trends in demand for short and intermediate credit was also mentioned. In the section which followed, the limitations of the study were mentioned. These limitations include those which were due to lack of appropriate data and the possible modification of data to the results obtained. Also, the specification of the models and the possible effect of mis-specification, multicollinearity and autocorrelation were discussed.

Data presented in the study suggests an upward trend in the demand for all types of farm credit in Canada over the period for which the study covered. During this period, costs of production, average farm sizes, capital accumulation and interest rates on all types of credit rose. Gross farm incomes have also grown in absolute terms but the rate

of growth in net farm incomes has been slower. The rising demand for farm credit as farm sizes and input costs increased during the period of slower growth rate of net farm incomes resulted in an excessive indebtedness. The outcome of these phenomena has been a decline in the rate of return on investment and an increase in the debt asset ratio of the farm sector.

The results of the analyses suggest that the level of capital accumulation is an important determinant of the demand for all types of farm credit. The statistics associated with the parameter associated with this factor and the high level of significance (95 percent for short and intermediate credit and 90 percent for long term credit) support this observation. Further support comes from the high wealth elasticity estimates for the demand of all types of farm credit. The importance of the level of capital accumulation becomes clear when one is reminded that the variable is a good index for assessing changing trends in average farm sizes. The larger the average farm size, the more credit is demanded.

The price indexes for short, intermediate and long term inputs showed up as important variables which influence the demand for farm credit. The significance of these variables were attributed primarily to the effect of inflation. Periodic shortages which occur in the supply of production (short term and intermediate) inputs also account for some of the yearly increases in cost. Another contributory factor has been the rapid rate of obsolescence brought about by the introduction of new techniques of production and the subsequently rapid increases in the rate of depreciation of farm capital. The depreciation variable was the most significant (99 percent level) among the other candidate variables in Model 2.11, the representative intermediate term demand model. The activity of land speculators, the

influx of capital from urban areas and the competition among high income farm operators for agricultural land have been the major contributory forces fuelling increases in real estate prices. Model 4.13 shows the index of land price as a very significant variable (95 percent level).

The index of physical production of agricultural output showed up as a significant determinant of the investment demand for short and intermediate term credit at the 90 and 95 percent levels, respectively. (See Models 1.11 and 2.11). The index of physical output is regarded, for the purpose of this study, as a valid proxy for assessing the effects of the technological revolution that has occurred in the farm sector over the period covered by the study. In this context, therefore, the results of the analyses in Models 1.11 and 2.11 attest to the importance of technical innovation as a factor which affects the investment demand for farm credit. Despite the statistical insignificance of this factor for demand of real estate credit, the inter-relationships that exist between the demand for the three kinds of credit do indicate that technological developments may indirectly affect the demand for long term farm credit

Net farm income, with the exception of the demand for production (short term) credit, did not show up as important determinants of the investment demand for farm credit. However, the negative value of the parameter associated with this variable in the results support the claim by Brake and other investment theorists as to the relevancy of the residual funds hypothesis in the investigation of investment demand.

On the whole, effects of fluctuations in the business cycle represented here by changes in the GNE, and changes in inventory accumulation (Inv), did not show up as important explanatory variables of the investment demand for farm credit as capital accumulation, input prices

or technological developments. The inventory accumulation variable was significant only at the 80 percent level. (Model 1.11). The Gross National Expenditure was significant at the 90 percent level in Model 3.13 and, therefore, serves as an important determinant of the year-to-year changes in demand for real estate credit.

Weighted interest rates for the various types of farm credit (taken as a proxy for monitoring effects of monetary and credit policies of the lending institutions), were significant at the 90 and 95 percent levels for short term and short run (year-to-year) demand for long term credit. (Models 1.11 and 3.13). They did not show up as significant factors affecting the demand for intermediate term credit and the demand in the long run of long term credit. (Models 2.11 and 4.11).

The effect of fluctuations in business cycles and of monetary policy cannot be disregarded despite the show of relatively low levels of significance. A careful investigation of the results reveal that in the short run, demand for real estate credit is affected by changes in the GNE and changes in interest rates. Interest rates also affect demand for short term farm credit. The interest rate variable in Model 1.11 is significant at the 95 percent level, supporting this observation.

In addition since trends in the demand for long term credit in each year may create multiplier effects on the demand for other types of credit, it can be concluded that factors of non-farm origin such as business cycle and monetary policy effects are also fairly important determinants of the investment demand for farm credit.

Reference to the Table of elasticities (Table 6.1), reveal that the elasticity estimates associated with the respective variables in

each of the representative models do support the significance of the t-statistics.

The wealth and cost (price index and depreciation) elasticities are significant at the 95 and 99 percent levels. Response to changes in technological developments is also significant at the 95 percent level. The significance of the response estimates of the three variables was higher, the longer the term of credit.

Income and interest elasticities of demand for credit, and response to changes in business cycle fluctuations were not as significant as those related to the effects of price indexes, capital accumulation or technological innovations in the farm sector on the demand for farm credit. However, the short run interest elasticity of demand for long term credit was significant at the 95 percent level. The results of the theoretical analysis of the long term credit market controversy points to the importance of response by lenders to conditions surrounding lending operations in the long term credit market. The results also support the suggestions of several writers relating to the need for effecting changes in credit policies and terms of lending of the government agencies.*

Chow tests performed on both the short and long run models for long term credit do not support the hypothesis that there has been a structural change in the demand for long term farm credit as a result of increased governmental involvement in the farm real estate market. Results of the short run, long term model however, seem to confirm the presence of an adjustment factor which influences the year-to-year expectations and demand for farm real estate credit. The existence of

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*The Minister of Agriculture has recently proposed Amendments to the Farm Credit Act. For a full account of this see Appendix.

a negative adjustment factor was attributed to effects of declining net farm incomes, and also, institutional and other restrictions and limitations associated with lending operations in the long term market. The possible multiplier effects of the negative adjustment factor as a major contributory factor causing a decrease in the total amount of all types of credit demanded from year-to-year, has been discussed.

It can be readily concluded from the results of the models selected that the linear (raw data) formulations are the best models for use in the analysis and prediction of the investment demand for short and intermediate term credit. The double logarithmic formulation is most appropriate for analysisng and predicting the demand for long term farm credit both in the short and long run. Despite the reduction in the degree of multicollinearity among the independent variables in the results of the first difference models, these models were discarded because they exhibited poorer model statistics on the whole.

Finally, it can be inferred from the results of the selected models that the integrated investment models used in the analysis and prediction of the investment demand for long, intermediate and short term credit, yielded satisfactory results.

Conclusions

In spite of the possible limitations of the study, the discussions and analyses performed based on the data presented and the results of the tests and investigations performed in the study do permit

a few conclusions to be drawn.

1. Data and discussion presented at the beginning of the study do confirm the important role of technological innovation in the structural transformation and increased capital investment in the farm sector.

2. The demand for all types of farm credit increased substantially from 1950-1975. During the same period, debt on all types of farm credit extended rose appreciably.

3. The statistics associated with representative models, the signs and significance of the independent variables seem to suggest that the use of the integrated investment demand models adequately explain changes in the demand for farm credit. The models can, therefore, adequately serve as a predictive tool for forecasting future credit requirements based upon trends developed from elasticity estimates generated over the years.

4. The significance of the Capital Accumulation (TVA) variable for the demand of all types of farm credit implies that the ability to operate efficient and economically viable farms in the future will depend to a large extent on increased capital accumulation and availability of farm credit.

5. Costs of production and especially, the effects of inflation and obsolescence are major factors which influence the demand for farm credit.

6. As has been mentioned previously, results of the analyses do confirm the relevancy of the residual funds hypothesis. This finding

implies that the increasing reliance of farmers on farm credit for investment purposes is in a sense an extension of the farm incomes problem.

7. Evidence can be gathered from the results of the analyses which suggest on the whole that changes in the yearly interest rates and Gross National Expenditure do influence the demand for long term credit. Because of the possible multiplier effects on the demand of other types of credit, the interest rate and changes in the GNE most probably do affect the demand for other types of credit indirectly. The implication of the argument above is that in any analysis and prediction of changes in the demand for farm credit, business cycle and monetary policy effects should not be excluded.

8. It can be concluded from the theoretical analysis of the farm real estate market controversy that response of lenders to changing conditions surrounding the operations of the long term farm credit market should be investigated. Since there seems to be no indication of a structural change in the demand of long term investment as a result of increased government involvement, the claim by critics that less government involvement will improve the credit market may be questionable. In addition, the results indicate that a negative adjustment factor operates in the year-to-year demand for long term farm credit. The existence of this factor may be attributed both to declining income effects and the existence of inefficient credit policies and other institutional restrictions which hamper the smooth operation and performance of the long term farm credit market. The results of the analyses also seem to suggest that a combination of both an adjustment and adaptive expectation models may be

more effective means of investigating the short run demand for long term farm credit.

Suggestions

A few suggestions are advanced below on the basis of the conclusions outlined in the preceeding section:

1. Research into low cost techniques of production in the farm sector should be intensified in order that the growing reliance on external financing by farm operators might be reduced. There are potential gains to be had in the event of an increase in the elasticity of supply of long term farm credit. The institution of programs which would be attractive to private lending agencies should be considered. Examples of such programmes are government guarantee of real estate loans and the relaxation of the concessionary interest rates on long term farm credit, in order to allow free interplay of market forces. The projected benefits of such programs can be assessed by estimating the potential response (supply elasticities) that would be forthcoming from the lending agencies. Further research into this topic will have to be carried out before any final decisions can be made on the long term credit market controversy.

2. There is the need for a reassessment of the credit policies and methods of operation that hamper the performance of the long term farm credit market, with special reference to government agencies.

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APPENDICES

news

Subject: PROPOSED AMENDMENTS TO THE FARM CREDIT ACT

Ottawa, March 10, 1978-- The Minister of Agriculture, Eugene Whelan, today tabled a Bill in the House of Commons to amend the Farm Credit Act. "Agriculture is changing at a fast pace and we must continually update legislation to ensure that the real credit needs of Canadian farmers are met," explained Mr. Whelan.

The Bill provides for an increase in the Farm Credit Corporation's capital from $100 million to $150 million. This would increase the Corporation's borrowing capacity to $3.75 billion. The capital was last increased in 1975 from $66 million to $100 million.

"There is some urgency to get this particular amendment approved because the Corporation's present borrowing capacity will be exhausted early in 1978-79," added Mr. Whelan.

"With costs rising for all agricultural inputs, it has become increasingly difficult for the Farm Credit Corporation to finance some sectors of agriculture. These amendments will go a long way to give the F.C.C. the needed flexibility and authority to meet this demand."

If passed, these amendments would raise the F.C.C. lending limits to $200,000 for all borrowers.

Loan limits are presently $150,000 for persons under 35 years of age and $100,000 for borrowers over 35.

"The proposed change recognizes that the need for credit does not stop at a particular age. The cost of increased mechanization and technological change faced by farmers can no longer be met from current income. These expenses must be amortized over longer periods," added Mr. Whelan.

"One age restriction that will remain is the 35 year age limit for young persons wishing to take advantage of the "phase-in program which allows them to keep an off-farm job for up to five years."

The present loan limits apply to farming units, which means that partners or a father and son can only qualify for one loan. The amendments provide for a new loan limit of $200,000 per operator up to a maximum of $400,000 for a farm unit where there are two or more operators who are qualified applicants.

Another amendment would change the way loan security is assessed. Standard loans are presently secured on an appraised or productive value while loans to persons under 35 years of age can be based on market value. It is proposed that all loans be based on market value.

A number of more technical amendments would help streamline the administrative operations of the F.C.C. The statutory $25. a year charge for supervision which is applied to loans exceeding 75 per cent of the appraised value, would be dropped. Advisory services would be offered free of charge to borrowers who want and need them.

Provision is made in the amendments to allow the Corporation to provide for future losses on loans in accordance with generally accepted accounting principles.

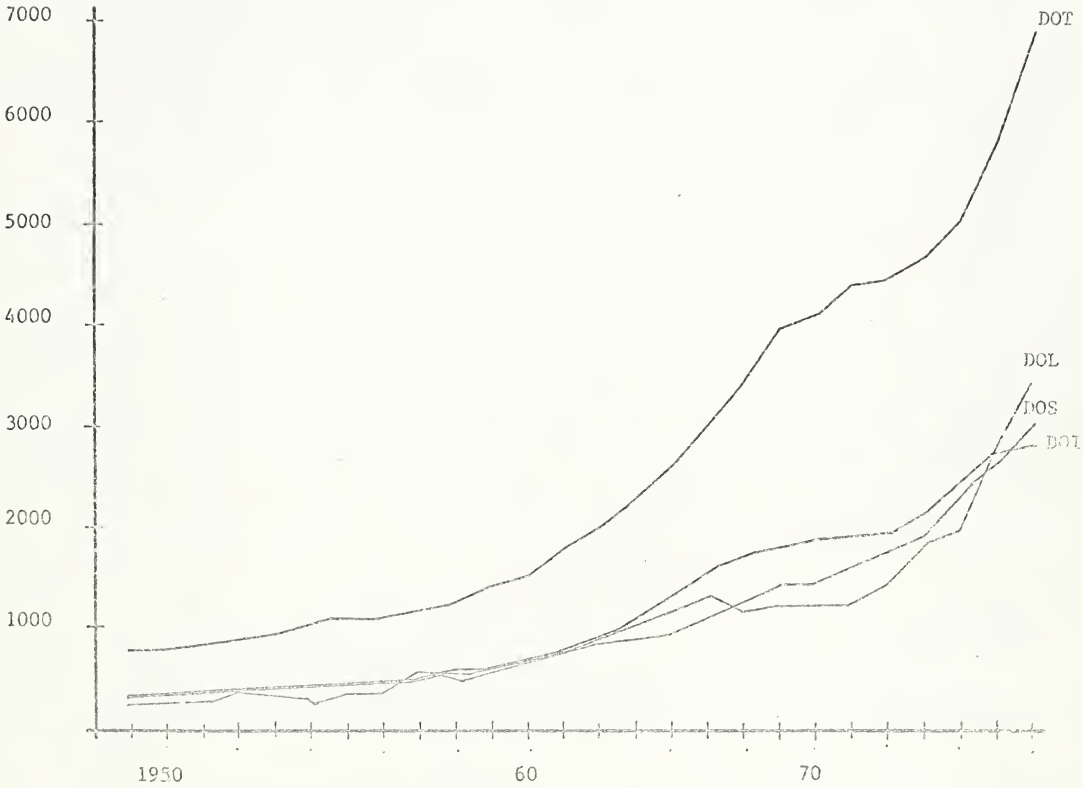
The penalty interest charge would be dropped in order for the Farm Credit Act to become more compatible with the spirit of the Interest Act which prohibits penalty interest except in specific Acts.

"I look forward to the round of discussions on these amendments. They are the result of continued research on the part of the Farm Credit Corporation combined with constant input from farmers, farm organizations, the F.C.C. Advisory Committee and elected reprresentatives who have written to me over the past few years," added Mr. Whelan.

To date, in 1977-78, the Farm Credit Corporation has approved $540 million for 6800 loans.

APPENDIX FIGURE I

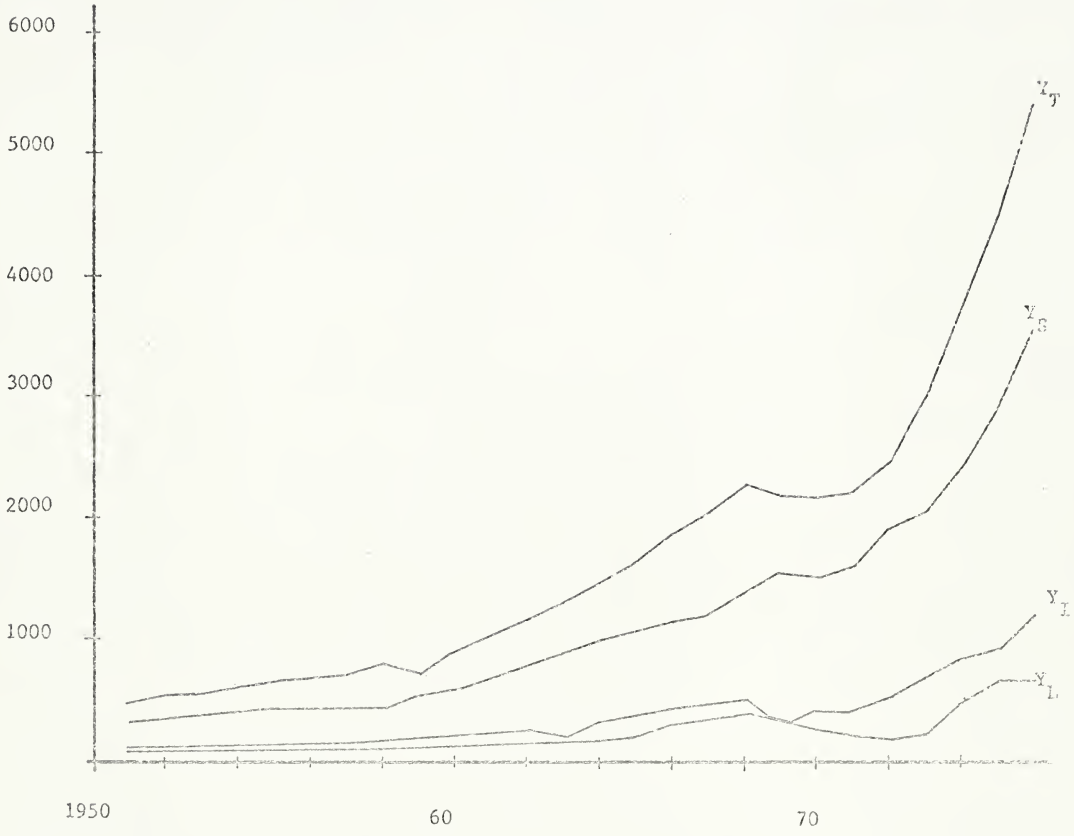
DEBT OUTSTANDING ON FARM CREDIT EXTENDED (1950-1975)



DEBT ON TOTAL CREDIT (DOT)
DEBT ON LONG TERM CREDIT (DOL)
DEBT ON INTERMEDIATE CREDIT (DOI)
DEBT ON SHORT TERM CREDIT (DOS)

APPENDIX TABLE 2

CREDIT EXTENDED (1950-1975)



TOTAL AMOUNT OF CREDIT EXTENDED	(YT)
LONG TERM CREDIT EXTENDED	(YL)
INTERMEDIATE TERM CREDIT EXTENDED	(YI)
SHOT TERM CREDIT EXTENDED	(YS)

DATE DUE

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